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Urban Air Quality

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ENVIRONMENT VIEWS

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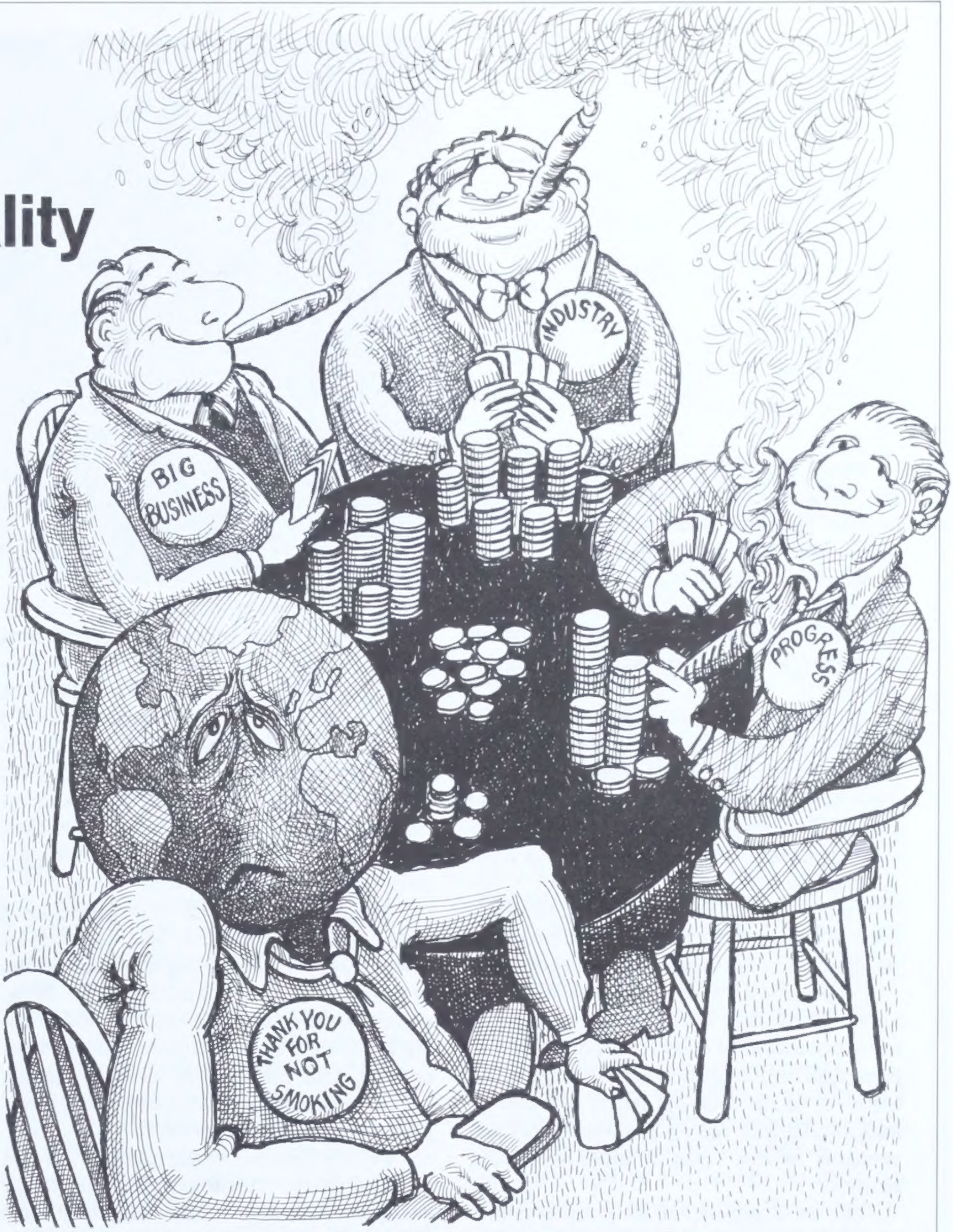
Alberta
ENVIRONMENT

Introduction: Maryhelen Vicars

Urban Air Quality

The air we breathe in our cities — how healthy is it?



Cleopatra's Needle, the priceless Egyptian obelisk which stands behind the Metropolitan Museum of New York, is crumbling.

The treasure has suffered more in the 100 years it has been buffeted by the pollution-laden winds of New York than it did in 3,000 years in the Egyptian desert.

In many parts of the world, man's activities are fouling the air at a rate far greater than the atmosphere's ability to cleanse itself.

Air pollution (defined as man-made contamination of the outdoor atmosphere) coats and corrodes buildings and other materials, reduces visibility, impairs plant growth and is a suspected cause of serious illness and premature death among both animals and humans.

The quality of urban air did not seem to catch the public's attention until the 1960s, although big cities throughout the developed world have had problems since the Industrial Revolution, and more recently, since the widespread use of fossil fuels.

"Smog" and its impact on people and other living things, was a big rallying point for the early eco-activists, who can take at least part of the credit for strong legislation in both the U.S., and Canada which has been responsible for reduced industrial and vehicle emissions.

Because of this improvement (however limited it must seem in such cities as Los Angeles and Tokyo) and because of the advent of the newer issues of nuclear power, hazardous waste disposal and acid rain, the question of urban air quality seems to have receded into the background for many environmentalists.

Dennis Wighton of the University of Alberta's genetics department, a longtime anti-pollution activist, doesn't feel we have anything to be complacent about. In an interview with Marylu Walters (story p. 6) he said that quiet from the environmentalists' camp does not mean they are happy with Alberta's air quality.

"I don't feel anything has changed. We do get some awful conditions now. It's sad but true that most environmental groups that were active in the late '60s and early '70s are defunct. They just lost their energy . . . Environment is not at the top of the hit parade any more."

But this gloomy view is not universally held. New groups have formed around other environmental issues, and air quality remains a prime concern for active lobbying groups such as the Canadian Lung Association. Cars are cleaner, and the public is more conscious of the importance of the environment than it was 15 years ago. As all of us, including decision makers in industry, are forced to conserve energy, there seems room for some optimism.

Although there is not what could be described as a crisis in urban air quality in Alberta now — in fact there has been some measurable improvement in recent years — it is timely to examine the situation critically. This issue of Environment Views should complement the issue on acid rain which precedes it. Many of the same contaminants which are precursors to acid rain contribute to poor air quality in modern cities.

The urban areas where most Albertans now live are expanding; and industrialization and the use of vehicles are both growing.

Air pollution, like acid rain, respects no boundaries. What happens in the U.S. affects Canada and air pollution generated in Alberta may find its way into Saskatchewan.

If one gazes into one of Sunny Alberta's blue skies, it looks as though the air continues forever. In fact, the layer of atmosphere upon which we depend for life and breath is a mere five to 10 miles deep.

This part of the earth's atmosphere, called the troposphere, is no deeper, proportionately, than the skin of an apple to the apple itself. It is into this very limited area that we are dumping thousands of tons of garbage, and there the refuse stays until natural forces remove it.

Above this relatively thin layer the mixture of gases which makes up the air we breathe becomes steadily less dense until somewhere beyond 250 miles from the earth it merges into empty space.

The process of man-made contamination of the atmosphere can be divided into three categories: attrition, vaporization and combustion.

Attrition is the general term for the wearing away of materials which can be dispersed into the atmosphere as particles or aerosols. This includes spraying, sanding, grinding and drilling or more gradual attrition, such as the wearing away particles of rubber from automobile tires.

Vaporization is the major cause of odors. Liquid vaporizes to form a gas either as a result of heat or pressure, or by evaporation.

Combustion is at the root of many of our air pollution problems. The byproducts of the combustion of fuels for transportation, power generation or heating are responsible for most of the total emissions in Calgary; and almost half the total emissions in Edmonton, where there is more industrial activity.

The most significant air pollutants are: carbon monoxide, particulates (dust), carbon dioxide, ozone, sulphur oxides and hydrogen sulphide, nitrogen oxides, hydrocarbons, fluorides, heavy metals and radioactive elements.

In the presence of sunlight, some of these can combine to form complex toxic compounds, the components of photochemical smog.

The American Lung Association, in its publication Air Pollution Primer, describes photochemical smog as an example of the complexity of the air pollution problem: contaminants combine to form new chemicals which are even more dangerous than their components.

"Today, when we speak of smog, we usually mean the Los Angeles type, which results from the action of the sun on the emissions of the ever-present automobile.

"The sun plays this major part because its energy can be absorbed by nitrogen dioxide in the presence of some hydrocarbons. (Carbon monoxide, incidentally, speeds up the change.) In the process, the compound separates into nitric acid and atomic oxygen. (Oxygen is usually present in the air not as atomic oxygen, O, but as a molecule O_2.) The atomic oxygen reacts with the oxygen molecules and other constituents of auto exhaust to form a variety of products, including ozone. Ozone is harmful in itself and is also a participant in a highly complex series of continuing reactions.

"Hundreds of chemical transformations, thus begun, take place at different rates of speed and continue as long as there is ozone or nitrogen dioxide and sunlight. New, equally undesirable chemicals result, including PAN -peroxyacyl nitrate — and formaldehyde. And, throughout, nitrogen dioxide is reformed and continues to function as the primary light-energy absorber.

"Photochemical smog is just one — albeit a major one — of the complexities of air pollution. Although we have examined some of the processes contributing to pollution one at a time, in reality there is no such simplicity. Industrial operations and their emissions constantly combine to form a terrible tangle of dusts, mists, gases and odors. Sorting out the individual pollutants becomes incredibly difficult — but vital."

As we look at the sources of pollutants, especially in our cities, it becomes obvious that urban air pollution is not just an industrial problem. While improved technology and strict regulation of industrial emissions are important, there is a lot which the individual city dweller can do to keep air pollution in check.

Helen Corbett in her story on individual initiatives (p. 30) explains just how important are such measures as forming car pools and keeping one's automobile and furnace in good shape.

It would be possible to reduce drastically urban air pollution by making use of the best available technology in industrial emission control; by replacing the private automobile by greatly expanded mass transit; by banning most open fires including fireplaces and incinerators; by requiring homeowners to install the most efficient furnace available and to meet rigid standards of maintenance; and by making super-insulation of homes and public buildings compulsory.

The costs of such measures would be staggering, and not just in financial terms. People treasure the mobility and freedom of the family automobile. Democratically-elected governments are very aware of the political costs of any law which appears to take away the public's freedom of choice. Consider, for example, the long slow battle for compulsory seat belt legislation in Alberta, despite Transportation Minister Henry Kroeger's personal support and a growing body of evidence that seat belts save lives.

The reckoning of the costs and benefits of any measure to control air pollution is not simple. The American Lung Association warns against taking a strict balance-sheet approach:

"Dollars are important, of course. So are buildings and clothing and crops. But let's not be caught in the trap of weighing the dollar cost of control against the dollar cost of pollution.

"Air pollution threatens more than man's wallet. And not only his health. Air pollution erodes his soul. Every mountain blacked out by pollution, every flower withered by smog, every sweet-smelling countryside poisoned by foul gases destroys a bit of man's vital union with nature. Time is making it increasingly clear that man is damaged by these spiritual losses as surely as by the sulphur dioxide in his lungs. 'The quality of life' is no idle phrase."

Maryhelen Vicars is the freelance editor of *Environment Views*.

VIEWPOINT

Elmer Berlie, P. Eng.

With regard to urban air quality, what are the conditions which will mark the 1980s as different from the 1970s?

In my view there will be two major differences in the 80s: a change in public perception of air pollution; and a more sophisticated public knowledge of pollution problems.

In the '80s, the public is much better educated on matters related to the environment than it was in the '70s. Credit for this is due the large number of environmental programs offered by high schools, community colleges and universities. The National Geographic and many other magazines, journals and wildlife publications are continuing to improve their coverage of air quality issues.

While the role of the media in education of the public is sometimes commendable, in my view, too many are biased, prone to exaggeration and sensation-seeking. The result of this kind of irresponsible reporting can be confusion of the issues rather than public education. It is my hope that the informed public of the '80s will be better able to cope with this problem.

Where are we now?

Studies of sources and emissions of air pollution in Calgary and Edmonton done during the early 1970s, and subsequent revisions to them, have led to government policies, guidelines and procedures which have had a positive effect. While not necessarily improving the situation, they have prevented a severe deterioration in urban air quality in the two major cities — despite a very large rate of population growth. Some examples:

Decentralization of new industrial development away from the major urban centres was initiated primarily to give economic advantages to less populated parts of the province, but maintenance of acceptable air quality in the larger cities was an equally important result;

Under the Clean Air Act, emission rates from industrial sources are strictly enforced;

The expansion of large-scale industrial operations in or near cities was limited to existing plants only and critical emission sources were required to upgrade their facilities;

And finally, support was given to mass transportation systems and freeway construction to reduce the impact of automobile emissions in urban centre.

Well, one might ask, has all this helped? The answer is an unqualified yes!

Without this program, I would argue, there would have been wall-to-wall petrochemical plants between Edmonton and Fort Saskatchewan, eventually seriously overtaxing the Edmonton airshed. The ever-present whiskey-brown haze of smog would be worse and the frequency and intensity of air pollution episodes would have increased.

The improvement of traffic flow by means of non-stop freeway designs and operation of LRT systems has lessened the impact of vehicles. In Calgary, by the end of 1983, it will be possible to travel non-stop from one end of the city to the other in a north-south direction. The Glenmore Trail, for the most part, allows this in an east-west direction now. High speed traffic of this type enhances dispersion of exhaust gases and eliminates higher levels of emissions associated with stop-and-go traffic.

In the last three years particularly, a greater number of cars on the road equipped with control devices has reduced emissions, as has the trend to smaller cars.

In Calgary, no new large industrial point sources have been constructed in or immediately adjacent to the city in ten years.

Where should we go from here?

There are four issues on which attention should be focused in order to improve air quality. These are:

- Education should be the challenge of the '80s for our educational institutions, technical societies and associations, the media and government at all levels. The most effective way to combat urban air pollution is an informed and well educated public. No priority should be higher.
- Calgary in particular should opt for a vehicle emission test program. Portland, Oregon has such a program, and it has demonstrated the favorable impact on air emissions from vehicles which are properly maintained and tuned. Reduced operating expenses are an unexpected benefit.
- Calgary in particular is developing an area in its downtown core where high rise building density is exceedingly large. Such structures create unusual air flow patterns. Given the peculiar effects of meteorology and topography on Calgary's air quality, I believe it is time for further study on the effects of such structures on the concentration levels of air pollutants.
- Calgary and Edmonton have shown a deterioration in esthetic values arising from the smog associated with growth in industrial and/or automobile emissions. A continuous monitoring program at several critical cross-sectional locations would assist in appraising change in the intensity levels of the haze that detracts from the quality of life in these cities.

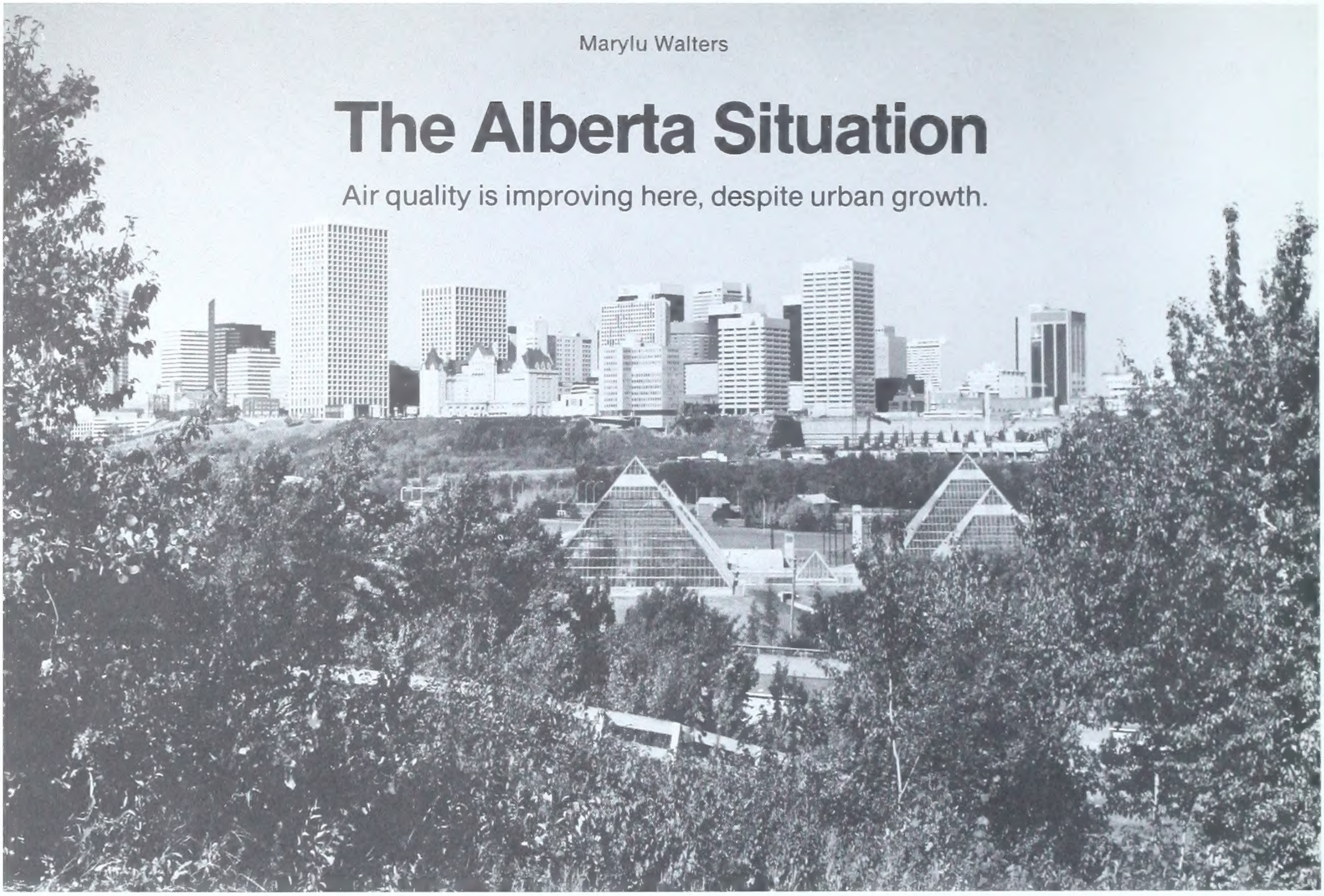
Alberta has been fortunate to have had a reasonably effective urban air quality management program for more than ten years. While serious, extended air quality deterioration has not been a major problem in the two major urban centres, more intensive monitoring and concentration of effort is required on specific aspects to prevent problems in the future. This will be particularily necessary if these centres continue to grow in population as they have in the past. Attention should now be focused on other urban centres to avoid deterioration in air quality as they grow.

Mr. Berlie is division general manager of consulting and technical services for Western Research and Development, a Calgary firm which does extensive air quality monitoring.

Marylu Walters

The Alberta Situation

Air quality is improving here, despite urban growth.



Within the next year, Alberta Environment will complete its first inventory of air pollution sources and emissions for Edmonton and Calgary since 1973. More bad news, right? Like taxes, inflation, the consumer price index and other barometers by which we measure the quality of our 20th century lifestyle, air pollution can only increase . . . or so we might assume through the pessimistic haze of the troubled '80s.

But, it's not necessarily so, says Alberta Environment's Jerry Lack, head of the air quality control branch of the pollution control division. Lack believes the figures his department will release soon will be a source of optimism that at least some things in this world are getting better — air quality control among them.

"We don't have all the data compiled yet, but I expect the numbers (total emissions of pollutants measured) will be lower," he says. "In fact, I would expect our air quality is actually improving, in terms of man-made pollutants."

Lack's optimism springs from his observation of reversing trends in two major causes of urban air pollution in Alberta pinpointed in the 1973 inventories: motor vehicles and industry.

In the wake of the Clean Air Act of 1971, massive industrial cleanups and voluntary installation of pollution control technology by industry over the past few years should result in reduced emission totals below the 1973 figures, Lack says.

Likewise, increased public concern over fuel economy and improved pollution control technology in the manufacture of automobiles should start to show up in lower average automobile emissions, he says. This phenomenon has less to do with the social consciousness of drivers than with their financial concerns, however.

"Most people don't care enough about pollution," says Lack. "But, if they don't do it for air pollution, they do it for their pocketbooks. And, with sealed carburation it's getting difficult for people to muck around with pollution controls on their cars."

Pushing against this cleaner air trend, on the other hand, is Alberta's urban growth. Put simply: More people equals more cars.

Another more subtle phenomenon is what Rod Heise, general manager of the City of Edmonton's transportation systems design department, calls the "labor participation rate."

"As more individuals in a family go into the work force, you find second vehicles in families contributing to peak period traffic," he explains.

"But, even so, we still expect the total emissions from vehicles to go down," Lack explains. "The newer vehicles emit one-tenth the hydrocarbons of the cars of the 1960s. Oxides of nitrogen are more difficult to control, but they, too, are less than with the older cars.

"For every older vehicle that comes off the road, you could bring on eight new ones with no increased effects."

High levels of carbon monoxide and hydrocarbons are registered at air monitoring stations during rush hours in downtown locations in both Edmonton and Calgary.

Overall emissions from gasoline-powered motor vehicles accounted for 82.2 per cent of total pollutant emissions in Calgary in 1973 and 37.8 per cent in Edmonton. In actual measure, the two cities are comparable with respect to motor vehicle emissions: 158,101 tonnes for Edmonton and 138,436 for Calgary. The percentage variance is due to Edmonton's higher concentration of industry, which accounts for some 57.6 per cent of that city's pollutant emissions compared to 9.8 per cent for Calgary.

Heise agrees with Lack that emission control technology is changing the pollution picture.

"We're forcasting a reduction in air pollution generated by vehicles," he says. "I'm optimistic that will occur."

Calgary transportation planner Chris Andrew shares this optimism.

"It's a generally accepted theory that air pollution will decrease with an energy conscious society, but it's hard to tell to what degree that is taking place."

Andrew points out that Calgary is a car-oriented city with .5 vehicles per person.

"But, people are thinking twice now about driving to the store for a loaf of bread. And people are taking fewer camping trips. The recreation industry is suffering."

Improved air quality will also be an indirect effect of policies in both cities encouraging the use of mass transit, according to Andrew and Heise.

"Air pollution is not enough of an issue in Calgary to have a direct impact on planning," says Andrew. "But, efforts to reduce congestion would hopefully have as a side-effect a reduction in air pollution. The newer buses are more fuel efficient and LRT is virtually pollution free."

In terms of industrial sources of air pollution, Edmonton and northern rural centres of Alberta have more to be concerned about than Calgary and southern Alberta. Yet, Lack believes the situation has improved over the past few years with the Alberta government's "work with" approach to industrial violators of the Clean Air Act.

"In the first place, we have a definite advantage over other industrial centres in Canada in that we use natural gas instead of fuel oils," he points out. "That means the amount of sulphur compounds emitted into our air by industry is very, very small relative to other areas."

Lack says some 98 per cent of cases where industries have been cited for clean air violations have been solved successfully without prosecution or stop orders. As a case in point, he offers the recent example of Dow Chemical in Fort Saskatchewan, which had been exceeding emission standards beyond acceptable levels.

In an agreement worked out between Dow and the government, the company completed $850,000 in improvements in its pollution control technology in the year 1980-81, with another $850,000 of work underway in the current year. According to Lack, Dow is committed to $7 million more in improvements for 1982-83.

Jerry Lack

Although total annual pollutant emissions for Edmonton have tended to run nearly two and a half the total for Calgary (418,990 tonnes for Edmonton compared to 168,351 for Calgary, acording to the 1973 inventory), the air quality in the two cities is comparable due to two major factors in air pollution in Alberta: meteorology and topography.

"Meteorology is *the* factor we can't control," says Lack. "It varies from year to year and we don't yet have a methodology for accounting for the meteorological factor."

The quality of air in Calgary sometimes gets worse than in Edmonton because of inversions caused by chinooks, according to Dr. Harby Sandhu, senior research manager of Alberta Environment's research management division.

An inversion occurs whenever a layer of warm air moved in and acts as a lid, temporarily trapping pollutants in a pocket of cooler air over the city. Edmonton's river valley is also prone to inversion effects in the evening hours when prevailing wind speeds drop below 12 to 15 km per hour.

In a 1979 study of air pollution of the North Saskatchewan River Valley in Edmonton, Dr. Keith Hage of the University of Alberta geography department reported that the valley behaves somewhat like a capacitor, storing carbon monoxide from late afternoon and early evening emissions and releasing it slowly at night.

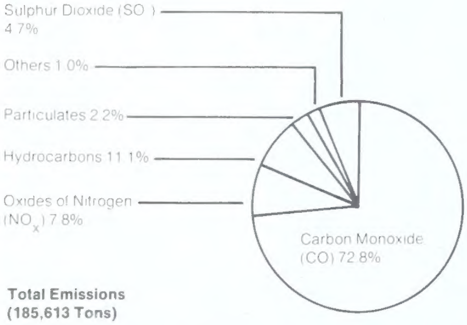
Concentrations of carbon monoxide reported by Hage were below the regulation limit of 13 ppm per hour, but Sandhu warns that air pollution data and projections should be carefully considered in any plans that would increase vehicular traffic in the valley.

"Our job is to try to anticipate these problems so the decision-makers can base their actions on scientific knowledge rater than gut feelings," Sandhu says. "In the case of air pollution, prevention is better than a cure."

One meteorological effect that plagues both Edmonton and Calgary and other urban centres in Alberta is the high background level of ozone in the air due to the province's high elevation.

Air monitoring reports for Edmonton and Calgary over the years show frequent readings in excess of the Clean Air (Maxi-

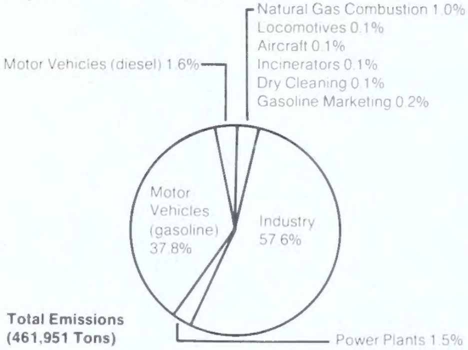
Source and Emission Inventory
City of Calgary — 1973



Total Emissions
(185,613 Tons)

Relative contribution of each pollutant to total emissions in the city of Calgary. 1973.

Source and Emission Inventory
City of Edmonton — 1973



Total Emissions
(461,951 Tons)

Relative contribution of each category to total emissions in the Edmonton area, 1973.

Alberta Environment, Polution Control Division, Air Quality Control Branch.

mum Levels) Regulations for a 24-hour period.

Ozone is a product of photochemical reaction of nitrogen oxides and hydrocarbons with sunlight. The high readings are attributable partly to the high natural levels of ozone and partly to interaction of the precursor pollutants. Existing levels of photochemical pollution (smog) can affect sensitive vegetation and materials as well as persons predisposed to chronic pulmonary disorders, according to the air monitoring reports.

In his 1975 study of photochemical air pollutants in the urban airsheds of Edmonton and Calgary, Sandhu concluded that the only effective way of minimizing and controlling photochemical air pollution in cities is to reduce the concentrations of both nitrogen oxides and hydrocarbons.

"Two main sources of photochemical air pollutants found in urban airsheds are vehicular traffic and industries," Sandhu reported. "Therefore, the direction for control is clear-cut."

Sandhu is concerned about growth projections for the year 2000 of doubled populations for both Edmonton and Calgary. By that time, present gains in air quality due to pollution control technology for motor vehicles and industry may be offset by sheer growth.

One mitigating factor, says Sandhu, is the government's policy of decentralization, spreading the growth and helping to keep cities at a manageable level. Air quality problems in smaller centres like Red Deer and Fort McMurray are minimal, mainly attributable to automobiles, according to Lack.

What does the future hold for urban air quality in Alberta? Again, Lack strikes an optimistic note.

"Compared with the dirtiest cities in North America, the air in Edmonton and Calgary is just so clean, absolutely.

"I'm optimistic that if higher standards become necessary in the future there will be policies brought about that will ensure continued acceptable air quality for the people of Alberta."

Marylu Walters is an Edmonton freelance writer.

Iris Dean

The Impact of Air Pollution

Dirty air takes its toll of buildings, gardens, pets and even weather.

Dr. Mary Spencer

The June day was sweltering, with temperatures near 30 degrees. My car window was open as I drove the busy freeway to a meeting in downtown Chicago. I was dressed in white — but not for long. When I arrived downtown and stepped out of the car, I literally shook the black soot from my carefully-chosen — and now very grey — outfit. Urban pollution became a reality for me.

Until recently, urban air pollution has not been a reality for most Albertans, mainly because it has been less noticeable. But air pollution is more than just soot and grime that falls from the sky. It's also unseen poisons which attack plants, animals, buildings and other materials.

Plants often act as the early-warning alarms of air pollution. The first harbinger of trouble is often the lichen, a spongy organism found on the branches and trunks of trees and on rocks. Lichen react quickly to air pollution, particularly sulphur dioxide SO_2, showing deterioration rapidly after exposure. Thin-leaved plants and newly emerging leaves of certain evergreens are also highly susceptible to SO_2 damage.

In some cities, gardeners select hardy plants which resist the ravages of air pollution, especially near industrial plants or heavily-travelled roadways.

In Edmonton, John Morley of the parks and recreation department is one of the staff responsible for selecting species of flowers, shrubs and trees for the city. He says that in Edmonton, "Pollution is not one of the major factors (in his selection of plants); it's not like in some cities in the United States."

The American Lung Association, one of the many groups working to increase public awareness of the dangers of air pollution, is concerned about plant life as well as human health. In a publication released in 1978, it reports that smog injury to plants has been found in at least 27 states. In the report several harmful pollutants which can be injurious to plants are named: sulphur dioxide, which comes primarily from the oil and gas industry; nitrogen oxides, from automobile exhausts, electric power plants, and fertilizer and explosives factories; fluorides, from the manufacture of fertilizer and aluminum, and iron ore smelting; and photochemical smog, composed of a number of complex chemicals resulting from the sun acting on automobile emissions.

Dr. Mary Spencer of the plant science department at the University of Alberta has studied the effects of ethylene on plants, animals and microorganisms for a number of years. Ethylene differs from other air pollutants in that it is a plant hormone. The plant uses naturally produced ethylene to control many aspects of plant growth and development. When ethylene from man-made sources impinges on plants at abnormal times and perhaps, abnormal concentrations, serious economic damage can be done. Ethylene will, for example, cause leaves to curl and drop off, fruit to ripen faster and flowers to age more quickly.

Automobile exhausts are the major man-made source of ethylene. Incomplete combustion of any fuel will also give rise to ethylene. Industrial production of ethylene, a feed stock for many petrochemical industries, must be carefully controlled to prevent atmospheric contamination.

At Environment Canada's Northern Forest Research Centre in Edmonton, Drs. S. Malhotra and R. Blauel identified sulphur dioxide as the major pollutant threat to plants. In a recent report examining the effects of air pollutants on forests, Malhotra and Blauel suggest that SO_2 damage can occur long before it can be seen. By the time visible symptoms appear, it is often too late to undo cell damage. Although the visible symptoms vary from plant to plant, SO_2 poisoning usually means the curling, yellowing or discolouration of leaves, drying, and then death.

According to Malhotra and Blauel, besides attacking the plant itself, SO_2 pollution attacks the soil too. When the plant suffers, the soil suffers as well.

Larry Pearson

Animals, like people, can be sensitive to air pollution. A large spill or accidental release of toxins from chemical plants can have dramatic effects on animals, including massive kills. But most often, the effects are more subtle and more difficult to pinpoint: hens lay fewer eggs, cows give less milk, sheep give less wool, others simply produce fewer offspring.

Dr. Leonard Lillie, head of animal sciences at the Alberta Environmental Centre in Vegreville, agrees that most city animals — dogs, cats, and birds — have much the same response to air pollution as humans. However, he says the lab has not identified any specific case of animal disease or sickness related to air pollution factors.

Odor and reduced visibility are two of the most obvious consequences of air pollution, and are most likely to lead to public complaints. Neither should be dismissed as mere nuisances. As well as affecting the "quality of life" for city-dwellers, both can have economic consequences.

Reduced visibility due to suspended particulate matter, nitrogen oxides or photochemical smog can stall air travel or cause hazardous driving conditions at ground level.

A quick scan of house prices downwind of an abbatoir or gas plant reveals the real consequences of the odor problem.

Buildings and monuments throughout the world are sustaining damage from air pollution to an alarming extent. Reports from cities like Athens, Rome, and London warn that historic buildings are crumbling to dust; that they're being eaten away by pollution.

In Athens, the deterioration of the monuments of the Acropolis has become so serious, that the United Nations agency of UNESCO has committed ten million dollars to save them. The Greek government has added another five million dollars. A committee of distinguished scientists, scholars, architects and historians is working full-time to try to come up with some solutions to the problem.

In Alberta, Larry Pearson of Alberta Culture is studying the deterioration of some older sandstone buildings in Calgary, including the city hall, built in 1911 of local sandstone. The damage is caused by increased levels of CO_2 and SO_2 in the atmosphre, which form acids when combined with moisture in the air. Those acids eat away at the calcium carbonate, the binding material that holds the stone intact.

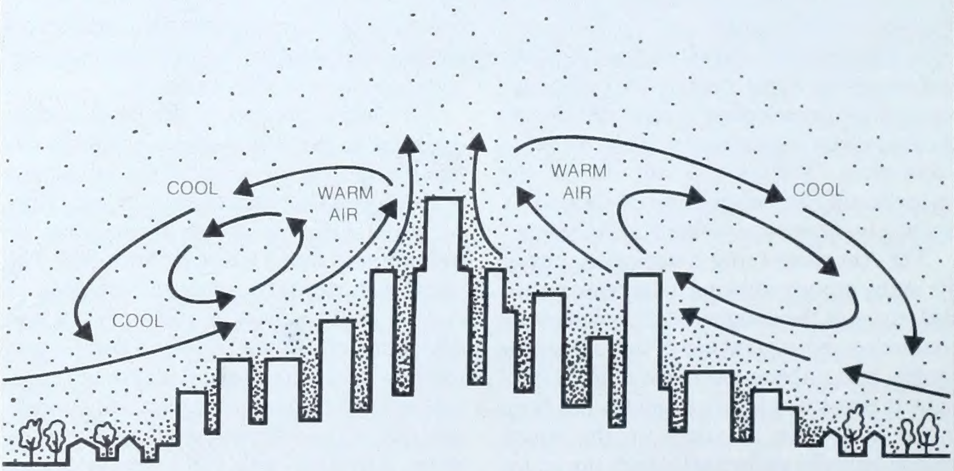
Besides acid-caused deterioration, buildings have other enemies as well. According to Peter Pratt, chief of restoration for Alberta Culture, industrial areas in Europe have a problem with soot — tiny particles of grime that adhere to buildings. Soot is not only an esthetic problem — the particles contain a variety of chemicals which, when wet, become harmful substances that eat away at building materials.

Pratt adds that methods sometimes used to correct or prevent the problem can cause as much damage as the original problem. Sand blasting is a common technique used to clean off accumulated grime and dirt. But according to Pratt, it's rough on brick and stone, and wears away protective outer surfaces.

When buildings are washed with chemicals containing acid, the acid dissolves the stone as well as the soot.

Another common method of treating or preserving buildings is waterproofing with materials like paint or fine cement stucco. But that could allow water vapor to build up beneath the outer layer, causing the siding to actually blow off the building.

Says Pratt: "This is generally accepted as not good for people below."



AIR CIRCULATION IN A CITY, SHOWING HEAT ISLAND EFFECT

Urban air pollution makes the window washer's job more difficult (left)

Foliage, so important to the esthetics of city life, is vulnerable to certain contaminants (below)

On the other hand, Pratt says there are effective methods of waterproofing buildings which must be incorporated in the original design. These include making the building waterproof architecturally, with window sills, cornices, and certain lines which help to throw off water.

One restoration technique, developed at the turn of the century, has backfired. It was thought that if steel beams were introduced for support at critical junctions, the deterioration of monuments on the Acropolis could be stalled. But time attacked the metals instead. The steel supports have corroded and several of the monuments are in danger of collapsing. Steel pins implanted to strengthen pillars have also shown signs of corrosion, cracking the surrounding stonework.

That same corrosion attacks modern structures and material in polluted environments. Bridges, industrial equipment, and vehicles all must be painted frequently to prevent corrosion.

While air pollution eats away at our historical structures, the modern-day urban monuments, high rise buildings, create their own unique problem, the heat island effect.

According to Dixon Thompson of the department of environmental design at the University of Calgary, the problem is more evident in eastern cities where humidity is generally higher, and there is less cooling down at night than in western cities.

Heat in the city comes from two sources: combustion within the city itself; and the absorption of the sun's energy by buildings and concrete. The tall buildings absorb the heat during the day, containing it by reflecting it from one building to another.

This heated air, which is concentrated in the city's centre, rises — with all its pollutants. Then, it expands and flows to the edges of the city. The cool air from the edge of the city flows back to the centre, and the process is repeated, creating a self-contained draft system carrying aerosols, miniscule particles suspended in the air. From a distance, one sees a dirty haze or hood covering the city. Only a good strong wind can break the cycle and disperse the pollution.

Air pollution is affecting another meteorological phenomenon on a global scale — the "greenhouse effect."

Direct radiation contributes little of the sun's energy to heating the air. Instead, the earth absorbs waves of light energy and re-radiates them as heat energy. At this point because of water vapor, carbon dioxide and ozone the atmosphere can and does absorb the heat energy. The air acts like glass in a greenhouse, allowing light to pass through it but holding back the reradiated heat.

In the 1880s, there were 280 to 290 parts per million of CO_2 in the air. But since then, according to Henry Hengeveld, carbon dioxide advisor to the Canadian Climate Control Centre in Toronto, the levels have been constantly increasing.

We're at 335 ppm today, and Hengeveld says we could reach a three to four per cent increase per year. Half of that would be absorbed by the oceans, and the other half would become a permanent part of the atmosphere.

"If that continues,"says Hengeveld, "The amount of CO_2 in the atmosphere will be double the 1980 level by the 21st century."

With the increased amounts of CO_2 in the atmosphere, the temperature of the earth will increase as the "greenhouse effect" is exaggerated. Hengeveld says the result could be an increase in the average temperature of the earth by two to three degrees Celcius within 50 to 100 years.

According to Hengeveld, scientists are preparing models to study what effects that increase would have on the world. Canada is likely to experience increased precipitation; but the grain belt of the central U.S. would have less.

Sea levels could increase five to six metres if the west Antarctic ice cap melted, drowning many of the world's largest cities, with overwhelming political and economic implications.

Hengeveld believes we need to address this question soon, particularly the effects of burning coal, one of the chief contributors of CO_2. He says, "The policies undertaken in the next 20 to 30 years will have an impact 1000 years down the road."

Iris Dean is an Edmonton journalist

Tom Shand

The Health Costs

A matter of life and breath? Links between polluted air and ill health are hard to prove.

One only has to take a walk, and a whiff, downwind from Edmonton's "Refinery Row" or try to see the Rockies through Calgary's hanging cloud of photochemical smog to realize our air is not clean. But is it harmful to the health of Albertans?

The jury is still out, but if air pollution in this province were considered innocent until proven guilty, its slate would be clean.

Alberta doctors and health officials do not view air pollution as a serious health problem, although some suspect there could be a problem in some areas. All agree, however, that any connection between deteriorating urban air quality and ill health would be very difficult to prove.

"You can examine people with diseases and recognize the symptoms," says Dr. Doug Sheddon, acting executive director of Community Health Services for Alberta. "And you can isolate the elements in the air. But it's very difficult to put them together."

"It's very difficult to translate chemical analyses into human health effects," explains Eric Peake, a chemist at the University of Calgary's Kananaskis Centre for Environmental Research. "There's a lot of data available but there has not been much effort put into translation because it's so difficult.

"We have high readings on occasion (in downtown Calgary) and I expect there's a correlation with health effects. We've never been able to define any problems, but it doesn't mean one doesn't exist. If we suspect a problem, we do something about it."

The problem of translation into health effects is so complex that, according to Dr. Robert Orford, executive director of Occupational Health Services for the Alberta government, there are only about six people in the United States working on it, and none in Alberta.

There are an unlimited number of interacting variables that come into play, making it virtually impossible to isolate the effect of air pollution on the health of people in a given community. The effects of specific pollutants on plants, animals and inanimate objects are often well documented, but health effects on the general human population have rarely been proven, except in extreme cases. And this is particularly true of the past 15 years.

There's never been an acute air pollution "episode" in Alberta. And the possibility of one seems remote. Therefore, it is more relevant to Alberta to concentrate on studies of the long-term health effects of urban air pollution — and why this vast body of literature comes to so few conclusions.

There are three means of gathering evidence on the cause-and-effect relationship between air pollution and human health problems: animal experiments, experimental human exposures and epidemiological studies of exposed human populations. Each has its values, but none is without major weaknesses.

Animal experiments can show toxicological effects and biological response mechanisms, but these can't be directly extrapolated to humans. Or as Sheddon phrases it, "You can say an element in the air causes cancer in rats, but it's difficult to say if it would have any effect on humans." To paraphrase one caustic Canadian comic, "Canadians' biggest problem is weak rats."

Experimental human studies can precisely quantify human responses to individual pollutants. But these findings may not be applicable to "sensitive" persons or to the general population exposed to a complex and changing pollutant mix.

"Your lung health and my lung health are a different story, as each person is physiologically unique," notes Jahala Currie, registered nurse and Calgary-area program co-ordinator for the Alberta Lung Association. "But generally, air pollution has the greatest effect on infants, the elderly and, especially, people with respiratory or pulmonary problems."

Dr. Robert Orford

Among the most extensively used sources are epidemiological investigations, which study effect of real-life exposures in various population subgroups. They are potentially the most useful, but also the most difficult with which to determine a causal relationship to any one pollutant or even community air pollution in general. The inclusion or exclusion of one related variable can change results dramatically. This alone accounts for many of the seemingly contradictory conclusions. Consciously or unconsciously, it's easy for groups to bias studies.

Foremost among the variables are: age, occupational exposure, cigarette smoking, housing, medical care, sex, urbanization, migration, climate and cardiopulmonary weaknesses. It's conceded that, at least in North America and Western Europe, smoking and occupational exposures are currently far greater hazards to cardiorespiratory health than is ambient air pollution — and may becloud or even conceal its effects.

But although air pollution may be overshadowed by other cardiopulmonary hazards, there is evidence that the effect of the interaction of these is often more than additive. This combined attack is often what breaks down the lungs' defence mechanisms.

Although air pollution can also effect the heart, eyes and kidneys, the lungs are unquestionably the primary target of most air pollutants. Therefore most studies deal with the effect of a pollutant or a group of pollutants on the lungs, often singling out population groups with some form of lung disease, such as emphysema, asthma, chronic bronchitis or cancer.

Adverse health effects have been associated with three major types of air pollution, from three major sources:

- Sulphur compounds and particulates: Coming from the burning of fuels containing sulphur, they're emitted from sour gas plants, coal burning plants, oil sands plants and the burning of trash. Other familiar sources are pulp and paper plants and petroleum refineries.

Sulphur oxides have a pungent odor, limit visibility and cut out light. Alone or combined with water to form an acid, they can yellow leaves, kill plants, dissolve marble, eat away iron and steel, and damage automobile and house paint.

High levels of sulphur dioxide over a year can aggravate chronic obstructive lung disease. And extreme levels over a 24-hour period can increase the rate of acute and chronic respiratory illness and irritate the eyes, nose and throat.

Particulates can cause altered lung function in children.

- Photochemical oxidants: created by the mixing of hydrocarbons, nitrogen oxides and, with energy provided by solar radiation, photochemical oxidants are largely related to motor vehicle emissions.

Short-term exposures haven't been proven hazardous to humans, but adverse health effects can be expected after long-term exposures at elevated levels. Effects of a one to four-hour exposure at such levels include increased frequency of eye irritation, cough, chest discomfort and asthma.

Nitrogen dioxide can cause an irritating, stinking brown haze. And the risk of acute and chronic respiratory disease increases with a year's exposure to elevated levels.

Carbon monoxide (CO), in large amounts, can kill, as all too often is shown by deaths in closed garages with a motor vehicle running. A small amount can cause dizziness, headaches and fatigue — which can slow driving reactions. It is particularly dangerous because it is clear and odorless and therefore hard to detect.

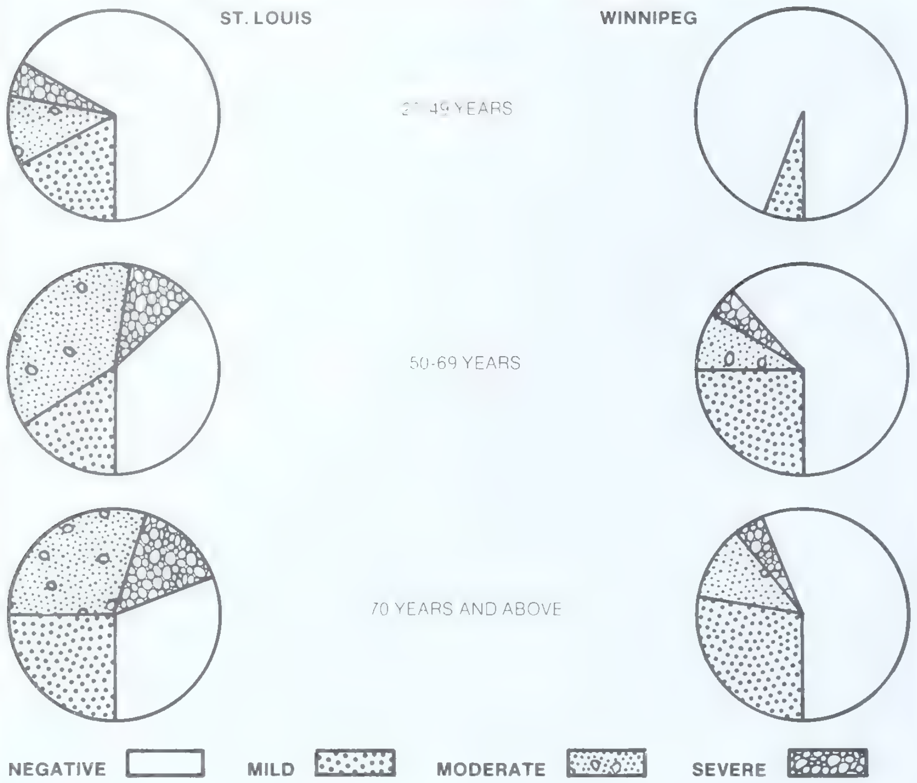
CO displaces oxygen from the red blood cells, forcing the heart to pump harder to get enough oxygen to the body. Its physiological effect is similar to anemia. Oxygen deprivation is most harmful to people with heart disease, anemia or asthma.

Hydrocarbons have much too low a concentration in the air to cause adverse health effects. However, these compounds act as precursors to photochemical smog and therefore levels must be carefully monitored.

- The final category is a miscellaneous class of air pollutants such as asbestos, arsenic, beryllium, cadmium, lead and mercury, emitted mostly by localized sources. They're most common in occupational exposures, but abnormally high levels are sometimes found near industry. There's also the risk of accidental release of dangerous quantities.

Asbestos fibres can cause asbestosis or cancer of the lungs, pleura and peritoneum.

Beryllium is used in metallurgic plants,



PREVALENCE OF EMPHYSEMA IN TWO CITIES WITH CONTRASTING LEVELS OF AIR POLLUTION

Prevalence of emphysema, as found in a 1960-66 post-mortem examination of the lungs of 300 residents of heavily industrialized St. Louis, Missouri and an equal number from relatively unpolluted Winnipeg. The subjects were well matched by sex, occupation, socio-economic status, length of residence, smoking habits, and age at death. The findings clearly suggest a link between air pollution and pulmonary emphysema.

lamp manufacturing and production for use in nuclear reactors. Exposure can cause growth of tumors on the lungs. But there have been no reported cases of poisoning from air pollution.

Cadmium, a product of smelters, has very low concentrations in the ambient air. Inhalation of high concentrations can lead to severe kidney and lung damage.

Although these pollutants can be dangerous at high levels, those levels are seldom reached in North America. And there's little evidence of harmful human health effects at low levels.

"There's little reason to think low levels of air pollution are an important factor in human health," says Orford, who does not consider air pollution a serious health problem in Alberta or most areas of North America.

But this has not always been the case. Despite the common myth that the air pollution situation is constantly worsening, the facts available show the opposite to be true. Man learned from his mistakes, but not without human sacrifice through tragic air pollution episodes.

These episodes were characterized by temperature inversions, which caused several days of air stagnation and greatly increased concentrations of atmospheric pollutants, especially sulphur dioxide. The best known episodes took place in Belgium's Meuse Valley (63 deaths attributed) in December, 1930; Donora, Pennsylvania (20) in October, 1948; London, England (4,000) in December, 1952; New York City (200) in November 1953; and London (700) in December, 1962. A significant relationship between periods of heavy pollution and increases in deaths was also found for New York from 1962-65, Philadelphia from 1963-64, Los Angeles in 1965 and Tokyo from 1966-69.

Although most of those who died were elderly or had pre-existing cardiorespiratory disease, many others suffered ill effects. For example, of the 14,000 people living in the industrial centre of Donora, close to 6,000 became ill. Symptoms included coughing, chest constriction, headaches, breathlessness, burning and tearing eyes, running nose, vomiting and nausea.

These episodes increased awareness of the dangers industry and automobiles posed to the air and promoted study and control of air pollution. Emissions standards were set, levels monitored and pollution control devices installed. And in London, residents were forbidden to heat their homes with coal. Emissions from coal burning mixed with fog and other contaminants, was responsible for the deadly smog of '52.

Dirty air can bring tears to our eyes

Similar episodes have not recurred in the western world since the mid-sixties.

"The chances, with our technology, of an (acute) episode happening today are extremely remote," Orford says.

In Calgary, despite carbon monoxide and photochemical smog levels caused by auto emissions and made worse by frequent temperature inversions, there is little evidence of serious health problems which could be attributed to air pollution. A 1974 study by Dr. Nancy Smith showed smoking to be the most significant health hazard from CO for Calgary residents.

In Edmonton, industrial emissions are higher than in Calgary or other smaller centres in the province.

Dr. Brian Sproule, head of the pulmonary division at the University of Alberta Hospital says, "It is suspected there could be a problem with hydrogen sulphide from Edmonton's petroleum refineries, but cumulative effects require time to develop and with human beings, documentation is a problem . . . I'm not being evasive, it is just hard to substantiate."

Doctors in Alberta often see fairly nonspecific symptoms of air pollution, such as irritated eyes and throats. But as Sheddon says, "People with non-specific complaints will attribute their problem to that (air pollution from a nearby industry). They like to have you say there's a problem and it's due to A, B and C. But if you say there's an eight in 1,000 chance it's due to the gas plant they're not happy."

With air pollution in Alberta considered only a potential problem, Orford suggests this would be an ideal time to take a large scale population survey of lung function health and ambient air conditions that could be used as a base for comparison as growth takes place. "This is the cleanest type of epidemiologic study," he says.

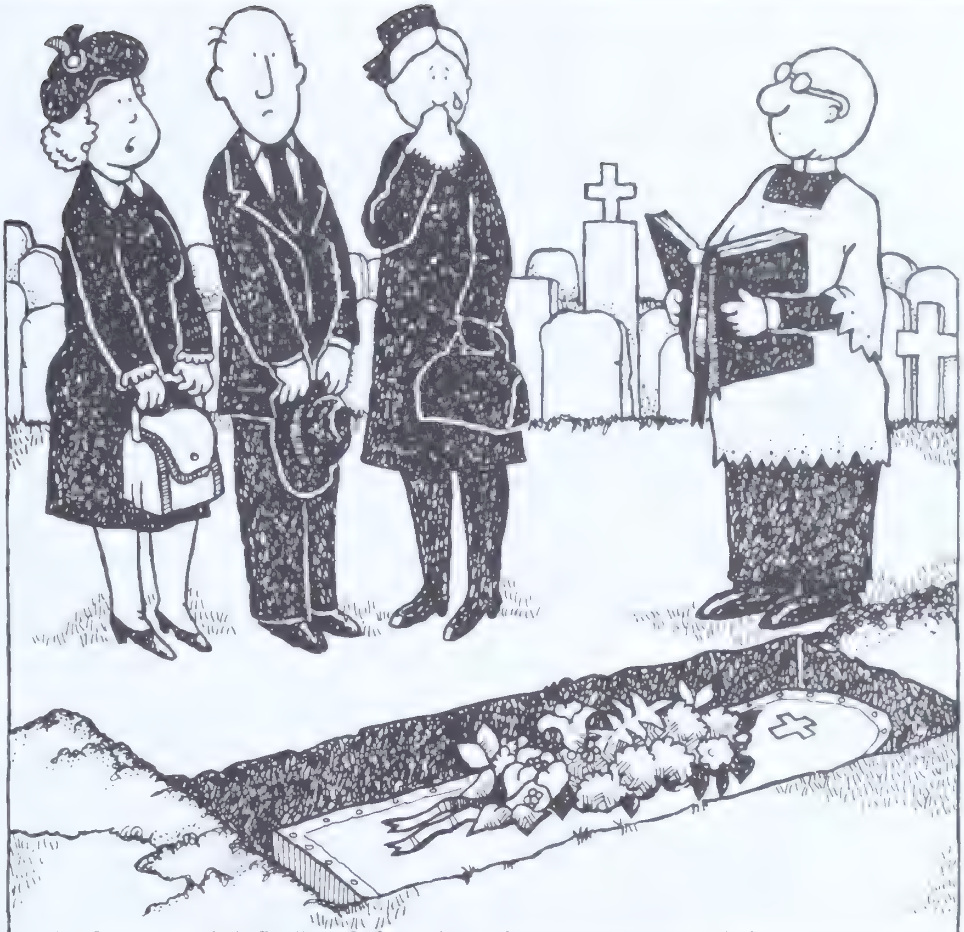
As it stands now, Orford says, "If you could choose a city or province in the world to live in, Calgary, Edmonton and Alberta would be pretty good choices."

Tom Shand is the public relations manager of the Alberta Lung Association.

Olenka Melnyk

Indoor Air Quality

Is bad air an occupational hazard for office workers and housewives?



Lucky George . . . he's finally safe from the environmental hazards of kitchen cleansers, car exhaust, recycled air, natural gas, foam insulation, wall panelling, cigarette smoke, fireplaces, carpet contaminants, brick emissions, clothing breakdown . . . . .

By six o'clock as she finished the preparations for her family's economical but nutritious meal, Mary was a sick woman. Waves of nausea swept over her as she stirred a cream sauce for the spinach. Depression and irritability weighed her spirits down like double anchors as she chopped scallions.

By the time she sat down to the dinner table, surrounded by the beaming faces of her loved ones, Mary was too ill to eat. The rest of the family was fine — what was wrong with her?

The family doctor was understanding and kind. He prescribed Valium and referred her to a psychiatrist.

The psychiatric diagnosis? Domestic angst — psychosomatic illness stemming from resentment and feelings of inadequacy, of failing to measure up to the Super Career Moms featured in all the women's magazines.

Sensibly, Mary was not satisfied with this explanation when her troubles persisted. She consulted another doctor who took a totally different tack. After a thorough physical which offered no answers, he questioned her about her home environment. The doctor found it particularly significant that Mary became depressed only when working in the kitchen. He grilled her about cleansers, floor waxes and appliances and finally isolated a probable suspect — the gas stove.

The doctor concluded that Mary suffered from a particular sensitivity to the noxious fumes given off by the stove. Replacing the gas stove with an electric one was the answer to Mary's indoor air pollution problem.

Pollution has been traditionally associated with the state of outdoor air. Studies on indoor air quality were based on the assumption that indoor air pollution came directly from outdoor sources. Researchers are beginning to recognize, however, that many contaminants originate within the indoor environment itself.

In fact, a number of recent studies indicate that air in homes and public buildings may be more polluted than a downtown city street during rush hour. When you consider that the average person spends about 90 per cent of his time inside, indoor air pollution emerges as a major potential health threat. Scientists are beginning to look for the connections between the environment and an alarming increase in allergies and cancer.

It's estimated that one in three persons suffers from some sort of allergy. The rate of diagnosed cancers has increased by one to two per cent a year between 1969 and 1977, according to Dr. Samuel Epstein, a University of Illinois professor of occupational and environmental medicine. Twenty-five per cent of all North Americans face the prospect of getting cancer during their lives and one-fifth will die from it. He predicts the incidence will rise even more dramatically in the next few decades.

In the past, people were protected from undesirable indoor air contaminants both at home and at work by the fresh air wafting through cracks in building walls and by opening windows and doors. Most buildings were veritable air sieves. But with the current energy conservaton measures to cut heating and cooling costs, buildings are more airtight, better insulated and ventilation is reduced.

Environmentalists are becoming concerned about the effects of this upon indoor air quality. Research has only recently begun in the U.S. on the problem of poorer ventilation, which may aggravate the effects of the myriad of chemicals and synthetic substances found in everything from building materials such as panelling and concrete to furnishings, carpeting, cleansers, machinery and appliances and our own clothing.

Formaldehyde has received widespread public attention as a result of reports of severe illnesses following the installation of urea formaldehyde foam insulation in homes. "Formaldehyde is just the tip of the iceberg in the issue of organics," says Dr. Craig Hollowell of the Lawrence Berkeley Laboratory in California. Scientists have also found high concentrations of benzopyrene – described as "one of the most unchallenged carcinogenics" by one researcher – in homes with wood-burning stoves, fireplaces and cigarette smoke.

One of the most deadly contaminants of indoor air may be radioactive radon gas, according to Hollowell. Radon is emitted naturally from concrete, brick, stone and even the soil under building foundations. Hollowell has estimated that at present indoor exposures, radon may be responsible for as many as 20,000 lung cancer deaths in the U.S. each year.

After testing the air in six San Francisco Bay homes, another Lawrence Berkeley re-

It's out into the fresh air for these office workers

Sealing the heat — and gases — in

search team found that the air inside contained noxious vapors such as carbon monoxide, nitric oxide and nitrogen dioxide in concentrations much higher than outside and up to four times the maximum recommended by U.S. federal guidelines. The researchers were shocked by these findings and made dismal predictions regard-ing air quality in North American homes with the 80s trend towards energy efficient houses.

Older homes average air exchange rates of one to two air changes per hour (acph), but newer homes have cut ventilation back to three quarters to one acph. Energy conservation measures are further limiting the air exchange rate in new homes to one quarter to one half acph.

"The researchers calculated that at the one quarter-acph rate, carbon monoxide levels could rise to three times those of heavily polluted urban air, nitric oxide could jump to five times peak outdoor levels, and nitrogen dioxide could zoom to ten times the level of downtown areas," says Dr. Alfred Zamm, reporting the researchers' conclusions in his book, *Why Your House May Endanger Your Health.*

Old houses may be more drafty but they're healthier, concludes Dr. Zamm. He singles out kerosene and utility gas ranges, furnaces, refrigerators and clothes dryers as the worst home pollutants, second only cigarette smoke. His findings are confirmed by a Harvard University School of Public Health study which measured nitrogen dioxide levels five times the U.S. air standard level in homes with gas stoves. Scientists have linked increased respiratory disease and decreased lung volume to the presence of gas stoves.

As researchers have just begun to turn their attention to the problems of indoor air pollution, there has been no definite agreement on the amount of ventilation required for the health and comfort of occupants either in the home or at work. In Alberta, industrial work places are monitored by the workers' health, safety and compensation department. Office and public building and homes are not covered by such legislation, although the building code lays down minimum guidelines.

Standards apply to minimum rather than recommended guidelines, says Frank Cass, mechanical supervisor for the building standards branch of Alberta Labor's general safety services division. The average residence in Alberta is required to provide five cubic feet of air per person per minute, or roughly one-fifth of an air change per hour. Seven to 10 cubic feet per person per minute is the recommended amount, however. Minimum requirements for kitchens are 20 cubic feet of air per person per minute (cfm), or about one third to one half an air change per hour. General offices are required to provide a minimum of 15 cfm per person and 25 cfm for conference rooms.

"Ten per cent of the air circulating inside should be fresh air," says Cass. "When people start falling asleep as soon as they sit down in a conference room, it may not be their fault. It's the way the building is designed; there's not enough air."

Steve Tyler of Alberta Energy and Natural Resources is an advisor to homeowners on insulation and airtightness. He says his department wants to monitor the situation of residential air quality over the next few years.

Tyler says adequate combustion air supply is crucial in homes with woodburning stoves and fireplaces. This supply can be drawn directly from outside by means of a fresh air duct. Inadequate ventilation can reduce the pressure in a house to such an extent that outside air can be drawn down a furnace chimney, carrying furnace exhaust fumes into the house.

There is a simple solution to the problem of inadequate ventilation for most homes, Tyler says. All combustion appliances should have independent combustion air supply from outdoors, and in addition, should have fresh air supplied directly to the cold air return duct. Alberta Labor's Building Regulation 1981 specifies that all new installations of any gas-fired appliance must have two independent sources of fresh air.

Builders have developed an air-to-air heat exchanger to deal with the special problems of ventilation for airtight energy-efficient homes. Tyler says that these devices, which sell for about $600 to $1,000, provide adequate warmth without heat loss by transferring the warmth from stale outgoing air to fresh incoming air.

But Dr. Val Geist, a University of Calgary scientist, says that the air-to-air heat exchanger is not adequate in itself. "We have to do much more, starting with buildings designed to make optimum use of natural sources of heat and light. Artificial heat and light should only supplement natural sources.

"Indoor air pollution and inadequate ventilation are now being seen as one of the major causes of low productivity among employees," says Geist. "What sort of productivity can you expect from people who quickly get tired and irritable?"

The study of environmental causes of disease is a relatively unexplored field of medicine. Symptoms of environmental illnesss, ranging from respiratory to heart problems, depression, fatigue and headaches, are frequently confused with other diseases. Scientists are still not clear about the precise effects of our often polluted indoor environment upon the human body. Much research remains to be done on the fundamental effects of indoor air pollution.

Olenka Melnyk is an Edmonton freelance writer.

Olenka Melnyk

Cigarette pollution

Tobacco smoke is the most widespread source of indoor air pollution.

"It outweighs exposure to any other chemical by far when you add up the average person's exposure over the course of a day," says Dr. Herb Buchwald, managing director of the occupational health and safety division of the Alberta workers' health, safety and compensation department.

Cigarette smoke contains a number of harmful compounds such as carbon monoxide, nitrogen dioxide, hydrogen sulfide, hydrocyanic acid and hydrogen cyanide, a highly active enzyme poison. Long term exposure to levels of hydrogen cyanide of ten parts per million (ppm) is considered dangerous; concentration in cigarette smoke is 1,600 ppm.

Tobacco smoke not only contains harmful compounds, but smoking aggravates the carcinogenic action of certain substances, says Dr. Buchwald. An employee working in an environment with asbestos increases his chances of lung cancer by 90 times if he smokes, for example.

Breathing someone else's smoke can be as damaging as smoking yourself. In fact studies have shown that smoke from a cigarette left burning in an ashtray contains almost twice the tar and nicotine of smoke inhaled from a cigarette and may be twice as toxic as the smoke breathed in by the smoker.

The Canadian Lung Association reports that this "sidestream smoke" contains three times as much benzopyrene (a carcinogenic compound), five times as much carbon monoxide (which deprives the blood of oxygen) and 50 times as much ammonia as "mainstream smoke." There is evidence that sidestream smoke also contains more cadmium. Cadmium is suspected of being one of the compounds in cigarette smoke that damages the air sacs of the lungs and causes emphysema, according to a pamphlet put out by the Lung Association called *Second-Hand Smoke.*

Federal air quality objectives consider outdoor air carbon monoxide levels above 13 parts per million (ppm) as undesirable. Smoking seven cigarettes in one hour even in a well-aired room, raises the carbon monoxide level to 20 ppm. The person sitting next to the smoker would be exposed to a 90 ppm level. Smoking ten cigarettes in an enclosed car shoots carbon monoxide levels to 90 ppm. The carbon monoxide level in the blood of nonsmokers as well as smokers doubles. It takes hours for the body to rid itself of carbon monoxide in the bloodstream.

Studies have shown that nonsmokers exposed to smoke only at work still experience a dysfunction of the small airways in the lungs comparable to smokers who inhale between one and 10 cigarettes a day. In a recent study, researchers at the Harvard Medical School found that children whose parents smoked at home suffered twice as many respiratory illnesses including a higher rate of pneumonia and bronchitis.

With the growing evidence of the health hazards posed by second-hand smoke, nonsmokers have begun demanding their right to clean and safe air. The city of Edmonton passed a bylaw a year ago prohibiting smoking in retail stores, hospitals, elevators and buses, and requiring restaurants to designate non-smoking areas. The maximum penalty for violations is a $500 fine. The city's bylaw enforcement division receives daily complaints about violations but so far only one charge has been laid. The manager of the Canadian Tire store at 10255 Mayfield Road has been charged with failing to post no smoking signs.

Jim Logan, director of Edmonton's bylaw enforcement admits there are problems with enforcing the law. "If someone insists on smoking in a restricted area, there's not much one can do unless the complainant calls the police in and lays charges." Most people don't bother. They'd rather not take the risk of creating a scene in a restaurant, store or other public place. Nevertheless, the smoking bylaw takes an important step in recognizing the rights of non-smokers and the importance of clean air, at least in principle.

Jack Spearman

Detecting Urban Air Pollution

One sniff is enough for some pollutants; others are more subtle.

Air pollution is first and foremost something that affects the human senses. You don't need a computer printout to see the layer of brown haze that hangs over Calgary during a temperature inversion.

In Sherwood Park, residents sometimes just need a single breath outside to remind them of Refinery Row a few kilometres west. There are times when all of us have sworn we can taste the contaminants in the air and feel them in our hair.

Albert Poulette knows all about this side of air pollution. As an air quality complaints investigator for Alberta Environment's pollution control division, he has personally experienced the spectrum of problems – everything from the mass evacuation of Mill Woods two years ago to an earful from an irate homeowner about the guy next door burning garbage outside.

"I think I know just about every odor by now," jokes Poulette. "I get calls on just about anything in the air that people don't like. Smoke, dust, smells, even pine tree pollen and fuzz in the summer from poplar trees."

A special 24 hour, seven-days-a-week complaints service was set up in 1976 and each year, its caseload has grown steadily. The toll-free "Environmental Emergency" number in the phone book is listed with the police and fire department numbers. Last year about 660 complaints were received from the public, including calls on this line, other phone calls and letters.

"If I get a complaint about smelly garbage, I refer them to the local board of health . . . maybe 20 times a year, somebody calls about the fumes at Calder Yards (CN's main maintenance and storage yards in northeast Edmonton) but there's nothing we can do there either because it's a federal responsibility."

Complaints about odors from oil and gas installations are referred to the Energy Resources Conservation Board with which the department has an agreement.

Still, Poulette responds to several complaints a day and he will try to get to the scene within an hour.

Albert Poulette

Much of his work is done in the industrial areas of north Edmonton. There are times, he says, when his problem is literally trying to catch the wind.

"The problem with a lot of odor complaints is that by the time I get out there, they've blown away. But if there is still something in the air, and I think that by now I recognize just about every smell in Edmonton, I can get back to the industry involved to see if perhaps there's been an equipment failure or something."

Other smells are trickier.

Poulette was once called out by a homeowner complaining about a petroleum scent in his backyard. It was there all right, but half a block away, it wasn't. Poulette eventually had a portable monitoring unit set up in the neighborhood which traced the problem to a small gas well. The flare sometimes sputtered out and when it did, it released puffs of foul gases into the atmosphere.

Poulette once took months to solve a case in east Edmonton in which residents complained of a smell of rotting excrement in the air. Poulette figured the culprit would be found in the industrial area further east but as he moved towards the plants, the smell changed.

Eventually, he found out the offensive substance was butyric acid, a waste by-product produced at the Celanese plant. The compound is so strong, says Poulette, that a shot glass full in the Northlands Coliseum would make the building uninhabitable for a week.

As a result of the complaints, the acid, which used to be dumped into a waste water pond for deep well disposal, is now burned, he adds.

For major environmental accidents, the province two years ago formed the Pollution Emergency Response Team (PERT).

Larry Begoray

Poulette representing the air quality control branch is a member along with representatives of Alberta Environment's pesticides, chemicals, water quality control, waste management and municipal engineering branches.

"Before PERT, we would have one person on call for one week, a different person every week of the year," explains Poulette. "The PERT approach is more comprehensive and allows us to be more investigative, especially after office hours when a lot of our calls come in." The basic idea behind PERT is that depending on the nature of the emergency, an expert in the proper field is on call to advise police and fire authorities and somebody who has a line of communication to other pollution experts in government and industry.

PERT was called out during the Millwoods evacuation, to a 2-4-D spill in Edmonton several years ago and to a recent fire and explosion at a Lethbridge pesticides plant.

Behind the on-the-street activities of the complaint investigations, both government and industry keep an eye on Alberta's air quality.

Monitoring of air pollution is done in two basic ways, says Larry Begoray, a pollution control engineer with the air quality branch.

First, measurements are taken at the source of the emissions to determine how much of a given substance is being released into the atmosphere. Secondly, monitors are set up downwind to determine ambient levels.

As a condition to provincial licencing underthe Clean Air Act certain industries are required to operate monitoring programs. At specified intervals, the industry must submit to the province its findings for scrutiny and assessment.

From time to time, says Begoray, a provincial official will go to the plant in question and inspect the monitoring program. "Our man will take notes and do some checks. We then may reject the industry's report or perhaps request some changes in how they operate."

"Each year we'll also do our own source emission survey. We will go out to, say, 45 sources and do a complete survey. We go in, take our own samples, do our own analyses and issue our own reports."

Some of the industries in east Edmonton have banded together to co-operate in air monitoring. In 1974, such firms as Imperial, Texaco, Stelco, Truroc, Alcan, C.I.L., Fiberglas, Gulf, Interprovincial Pipeline, Building Products, Celanese, Shell, Turbo and Uniroyal formed the Strathcona Industrial Association to consolidate pollution programs and to build up a bank of basic data on the quality of the airshed in the area.

"This decision resulted from a concern of the association that environmental interaction between industry and urban development was increasing," states the association in a background paper. "However, there was an important lack of data on the quality of the airshed east of Edmonton. Without such information, the association realized that scientifically sound environmental planning decisions could not be made by government or industry.

"Following a year of operation, the association considers that these objectives are being attained."

The association set up five monitoring stations in the area to measure levels of four pollutants — sulphur dioxide, hydrogen sulphide, nitrogen oxide and suspended particles. The findings, says the background paper, have been encouraging in three of the four substances. "Mean total suspended particulate levels, however, are near or above provincial standards at all monitoring stations. Should levels of gaseous pollutants increase substantially, in the future there is potential for synergistic effects between gaseous pollutants and particulates."

To monitor the ambient effects of air

Air Monitoring Station in Edmonton

pollution in Calgary and Edmonton, the province operates six permanent stations, in each city's industrial, residential and downtown areas.

The stations consist of six-inch intake pipes connected to an automated analyzer that in a matter of minutes, breaks down levels of sulphur dioxide, nitrogen oxides, carbon monoxide, ozone and suspended particles. The stations in turn are hooked to a computer link-up so that up-to-the minute readings are available 24 hours a day.

Computer models are also used by Alberta Environment to try to predict ground level concentrations of pollutants on the basis of data collected at the source, explains Begoray. He cites the example of a gas plant at which it is known how much of a given substance is released at a given time. By computing such factors as wind direction and velocity, topography, temperature, and the height of the stack, the computer will give an estimate of levels downwind.

"This tool allows us to see if the plant in question could be better designed: for example, if the stack height could be adjusted," says Begoray.

Last summer, the province brought in a highly sensitive, trace gas spectrometer unit (called TAGA) from its Ontario manufacturer. It was set up to look for minute elements in the air from Fort McMurray south to Pincher Creek. The results of its work are expected to be released later this year.

As far as the public is concerned, perhaps the most identifiable aspect of air pollution monitoring is the Air Quality Index for Alberta. The IQUA was developed by a federal-provincial committee in 1978 and adopted by this province the following year. It converts readings for five common pollutants into an easy-to-understand scale from one to 100+, the lower the number being the better quality of air.

For example, 0 to 25 is a good reading, 26-50 fair, 51 to 100 poor and above that, very poor. In both Calgary and Edmonton, levels are most often below 25 but from time to time will slip into the fair range, usually during a temperature inversion or chinook which traps pollutants close to ground level.

IQUA can be reached in Edmonton at 427-7273; in Calgary at 262-9277.

When levels exceed 100 for protracted periods, long term action is required to lower the risks to public health and the environment.

Jack Spearman is a Calgary freelance writer

Sharon Adams

No Mountain View Today

What can Calgary learn from Denver's solutions to air quality problems both cities share?

Calgary and Denver, Colorado, have a lot in common. Both are located an easy hour's drive east of the Rocky Mountains. Their downtowns, dominated by highrises, are located in topographic bowls near the confluence of rivers.

Their residents, too, share similar lifestyles. They like suburban life and have a love of motor vehicles. They make liberal use of their automobiles, recreation vehicles and campers to turn the nearby mountains into a virtual backyard, year-round playground.

Even the weather in the two cities is similar. Warm chinook winds give welcome relief from winter weather.

The similar topography, concentration of motor vehicles and chinooks combine to form another unsurprising parallel: an air pollution problem caused by motor vehicle exhaust.

In both Denver and Calgary motor vehicles contribute more than 80 per cent of the air pollution problem. Denver violated standards for five pollutants about 30 per cent of the time in 1981 — mostly during the winter months. In Calgary, Alberta Environment 1981 air monitoring results show high levels of the same pollutants occuring during the November through March period.

Though air pollution in the two cities comes from the same source, Denver is mapping strategies to counter it because that city's problem is more severe, for several reasons.

First, Denver is about 1.6 kilometres above sea level, with the result that motor vehicles in that city have less complete fuel combustion than those operating at Calgary's altitude of just over 1 kilometre. Second, Denver, at about 1.6 million in population, is about three times larger than Calgary. And finally, Denver is slightly closer to the mountains, so that cleansing chinook winds, due to an arching effect, do not touch down as frequently to clear away trapped pollutants.

Don Barbarick, air pollution meteorologist with Colorado's air pollution control division of the department of health, says the worst violations occur during the winter temperature inversions associated with pre-chinook conditions.

In temperature inversions, polluted cold air is trapped near the earth's surface by a blanket of warmer air above. There are two types of inversions which affect the two cities. In nocturnal inversions, the earth loses heat into the atmosphere after the sun goes down. If there is no wind to disperse the pollutants, they are trapped until cold air seepage draws the pollutants down the river valleys or until the air warms up after sunrise.

In inversions common before chinooks, warm winds high above the earth act to contain the cold air mass, and its entrapped pollutants. When the chinook "touches down," the pollutants are swept away.

Mr. Barbarick says Denver's pollution problem worsens in winter because fuel combustion, about 20 per cent less efficient than normal because of the city's altitude, is even worse due to the cold. Drivers idle their cars more and return home in the evening without warming the engine properly. As well, afternoon rush hour starts after the sun sets, so pollutants are trapped by nocturnal inversion. If this is exacerbated by a pre-chinook inversion, the combination could pose a health hazard.

Just such a set of circumstances occurred Dec. 4, 1981, when Friday evening rush hour, traffic jams due to street closures for the Christmas parade, and an intense nocturnal inversion combined to cause pollution to rise to danger levels.

"We had a brief surge to intense levels, but it cleaned out after midnight," says the meteorologist.

Eliot Cooper, an environmental engineer

POLLUTANT VIOLATIONS COMPARED WITH STANDARDS

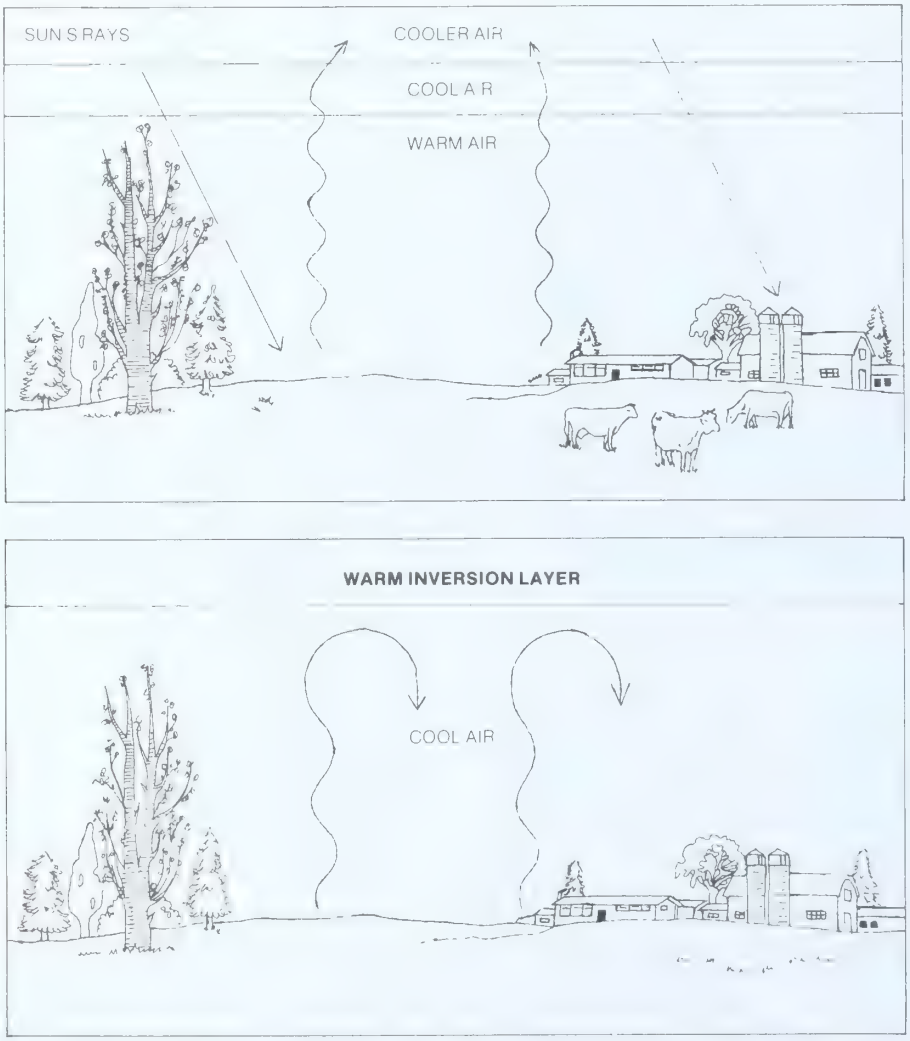
	Calgary	Downtown readings	Denver	
Pollutant	Standard	% readings in Violation	Standard	Violation
Ozone	.051 ppm 1-hr .015 ppm 24-hr	.8% 37.8%	.12 ppm	1½ times the standard annually
CO	12 ppm 1-hr 5 ppm 8-hr	1% 9.9%	35 ppm 1 hr 9 ppm 8 hr	3 times the standard annually

U.S. standards were not comparable to those in Alberta except for the two above, which I include in case you're interested. If not file 13 va 'viable alternative.'

with the Denver regional office of the federal Environmental Protection Agency (EPA), says eight monitoring stations keep a record of lead, sulphur dioxide, oxides of nitrogen (NO_X), ozone and carbon monoxide (CO) levels in Denver. (see chart)

Mr. Barbarick reports that in 1981 Denver violated one or more standards for those pollutants at one or more of the monitoring stations 30 per cent of the time, and though that's down substantially from the 48 percent violation level of 1978, "it shows Denver as one of the dirty cities" in the United States.

"And it's primarily because of our topographical situation," he says.



EFFECT OF THERMAL TURBULENCE ON AIR CIRCULATION
At midday the sun's rays warm the earth and create an unstable condition with the warmest air at the bottom and moving freely upward (top). At night the cool earth cannot heat the surface air enough to penetrate the warm air layer above. In consequence, the surface air, with whatever pollutants it contains, remains close the the earth (bottom).

Randy Angle, head of scientific application with Alberta Environment's air quality control branch, reports Calgary shows only minor violations of the standards at its three monitoring stations, and most of the violations occur during winter temperature inversions.

Motor vehicle-induced air pollution has become a political hot potato in Denver because the United States congress is considering relaxing the vehicle emission standards under the Clean Air Act in an attempt to aid the ailing auto industry. The emission standards are cited as one reason the proportion of Denver's violation days has dropped over the past five years.

Josh Epel, co-ordinator of the activist Colorado Clean Air Coalition, says air pollution affects the health and safety of residents. The coalition hopes to develop "grass roots" opposition to lowering of the emission standards, and to "educate and mobilize people" to fight air pollution.

"The most efficient way to reduce Denver's air pollution is to regulate the automobile," says Mr. Epel. "If we car pooled two of five days, air pollution in Denver would disappear."

Mr. Barbarick credits federal emission standards, high fuel costs, turnover of old car stock and use of mass transit and car pooling for the steady decline in Denver's violation days.

Mr. Epel claims if the U.S. Congress approves lowering emission standards, the Denver pollution problem will assume its old proportions.

The EPA's Cooper agrees, saying if emission standards are reduced, Denver, which was to have met all federal air pollution standards by 1990, "may never show."

Dave Ross, acting chief of the technical services division of the Colorado health department, says while the state is working to attain current standards through such measures as state automobile inspection and maintenance legislation, a number of measures now being discussed at the local and state levels may be brought into play to fight air pollution.

He says regional governments have discussed a number of measures to help meet federal standards which could also be turned to helping the city cope with the relaxation of emission standards. Those measures include: a no-drive day in Denver, adding to the bus fleet, light rail transit, bus-only lanes, high occupancy vehicle lanes, two-tier parking rates which would penalize single-occupant vehicles and tax rebates for transit users.

Regional governments have also suggested the state impose a 10-cent-per-gallon gasoline tax as a disincentive to auto use.

The best bet, though, says Ross, is "state vehicle inspections to ensure all cars perform at peak levels."

Gurdon Peck, Alberta Environment's regional supervisor for the air quality control branch in Calgary, says Calgary has benefitted from the U.S. emission control standards.

Despite a doubling in size, the city has maintained steady pollution levels. Lowering of U.S. standards could have an effect on Calgary's pollution levels should Canada also relax its emission standards for U.S. import cars, popular in Calgary.

Chris Andrew, a transportation planner for the city of Calgary, says while there are plans to reduce the number of vehicles in the downtown core, it's more to lessen traffic congestion than to cut down on pollution, though he adds a drop in pollution could be "one positive benefit."

Sharon Adams is a Calgary freelance writer

Norma Ramage

Industry's Role

If industry take some of the blame for air pollution, it wants its share of credit for progress made.

It's a typical late winter day in Calgary with a warm southern wind hinting of spring just around the corner.

But that southern wind carries hints of things other than springtime — things unpleasant and noxious. It brings with it a thick, whiskey-colored pall of smoke and haze which hangs low over the city, making pedestrians and motorists cough and wrinkle their noses in disgust.

The cloud is the infamous Calgary inversion layer caused by the unique geographical location of the city. A warm air mass aloft blows off the mountains and traps the pollutant-filled city air at ground level while a strong southern wind blows it against the natural bottle neck of Nose Hill to the north. The result is trapped air, a thick, brown smog that can hang over the city.

Although the smog that comes with an inversion layer is not typical of Calgary's air quality, its arrival helps bring home to Calgarians and to other Albertans that air pollution is just as much a reality of life out here in the clear, wide open spaces as it is in the more congested industrial areas of central Canada and the eastern United States.

While Calgary and Edmonton aren't in danger of becoming another Sudbury or Pittsburgh, on any given day an observer standing on a high point of land above most of the province's cities can see the brown-tinted haze of air pollution.

Who's to blame for this smog? The easy answer that comes quickly to most people's lips is industry — the bad boys of big business whose smoke stacks and chimneys can be seen belching forth on the horizons of most big Alberta cities.

But Graham Norman, a technician and analyst with Alcan in Edmonton takes exception to this facile answer.

"The Strathcona Industrial Association has been doing its own monitoring of the air pollution here and our findings generally show that pollution here is lower than it is elsewhere in Edmonton."

Norman, former chairman of the technical committee that set up Strathcona's air monitoring system, is sure a lot of the responsibility for urban air pollution rests squarely on the shoulders of Joe Q. Public.

Alberta Environment studies tend to support his view. The department's Emission and Sources Inventory fingers automobiles and other forms of transportation as the major air polluters in the province's cities.

But that isn't to say that industry is Simon Pure when it comes to air pollution in Alberta's cities. Power plants, oil refineries, cement plants, fertilizer plants, meat packing plants and, increasingly, construction sites, pump dust, nitric oxide, ammonia and sulphur dioxide and other contaminants into the air we breathe in our cities.

And as the province becomes more industrialized, the problems grow. To fight it, the Alberta government decided in 1971 to set up what many people consider to be the most stringent air pollution standards in Canada.

For example, Jerry Lack, head of Alberta Environment's air quality control branch, says the provincial one-hour ambient standard for sulphur dioxide is .17 parts per million compared with .25 for Ontario and .34 in Manitoba.

"Our standards are so stringent that even if they are exceeded by industry, that doesn't mean there's going to be any environmental damage," says Lack.

The province controls air pollution under the Clean Air Act, but more importantly, by using the ambient air standards delineated in the licences companies must obtain to operate. These must be renewed every five years. Maximum source emission levels for each plant are stated in their licences as are required pollution control equipment and a schedule for meeting new, more stringent provincial air pollution control guidelines.

These guidelines are usually much lower than the provincial standards, says Frank Witthoeft of Alberta Environment's standards and approvals division.

"Standards are the maximum allowable emissions, enforceable by law. Guidelines are suggested figures, the levels Alberta Environment feels the companies should be trying to meet just down the road. They aren't

Graham Norman

enforceable by law but we try to negotiate with the companies about them."

This system of negotiation is the method preferred by Alberta Environment. They prefer to sit down with industry and talk about improving air quality rather than wielding the big stick of legal action.

Says Jerry Lack: "Because our standards are so stringent and allow us so much leeway before environmental damage, we have the luxury and the time to sit down with the companies and talk to them about putting in controls."

"Most people when they think of enforcement think of prosecution but that's only one way," Lack explains.

But, says Lack, that doesn't mean the province isn't willing to get tough.

"If we think there's a problem, we issue an emission control order. We still talk to them because we know companies have cost problems but we also make sure the wool isn't being pulled over our eyes," Lack says, adding that 98 per cent of emission control problems are solved at this level.

But if this doesn't work, Lack says the government goes to the next step, prosectuion. If that doesn't deter the company, the final step is to issue a stop order that closes down the plant. This final step, however, is rarely used, according to Lack.

It is the rarity of this stop order that concerns many environmentalists who feel industry will only put in emission controls if they're forced to do so by fines and closure.

However, businessmen like Graham Norman feel Alberta Environment's methods have been strikingly successful.

"Industry generally supports Alberta Environment's approach. Their standards are tough but it's fair ball."

Elmer Berlie of Western Research and Development, a firm which acts as environmental consultants for industry, agrees with Norman.

"Alberta administers a very good, tough program on air quality. They have been firm and fair."

While Berlie doesn't pretend industry doesn't need a push in the right direction, he points to the sudden increase in firms like his own over the last 10 years as an indication that many companies are anxious to be good corporate citizens.

Berlie feels Alberta Environment's system of negotiating provides the best of all possible worlds — a clean environment allied to a strong industrial base.

Norman agrees, pointing to the province's methods of dealing with older plants.

"When Alberta Environment deals with older plants, it's looking at the best practical technology available, not the best theoretical technology available. It takes cost into account."

On the other hand, when dealing with new plants, the province wants them to put in the newest and most efficient air pollution controls, says Norman.

The result of Alberta Environment's approach has been a willingness on the part of industry to play ball.

Norman points to the many self-monitoring programs carried out by industry, including the one he is associated with, the $500,000 air monitoring system recently established by the Strathcona Industrial Park.

Norman is also anxious that industry's co-operation reach the public's ear.

"I suppose it's partly industry's fault for not taking more initiative in publicizing what we're doing. Things like the air pollution at Suncor make the headlines, and I think they should, but nobody hears about the industries who are spending hundreds of thousands of dollars to control air pollution."

Norman says he has suggested to Alberta Environment that it publish the names of all the people it is approaching about emission controls. Such publicity, Norman feels, would give both the industry and the department greater credibility.

Whether or not they agree with Norman about submitting their work to public scrutiny, most Alberta Environment officials say they're satisfied with their approach.

Western Co-op Fertilizer plant (left)

Edmonton Power's Rossdale power plant (centre)

One of the companies that has recently been negotiating with the government about emission controls is Edmonton Power. The company's Rossdale Power Plant, situated in the heart of Edmonton on the banks of the North Saskatchewan River, is one of the most visible sources of industrial pollution in that city. The thick plumes of steam which rise from the plant's stacks are a familiar sight to Edmontonians going to and from work.

The emissions, which are highly visible in winter, are mostly water vapor, Witthoeft says..

"The Rossdale plant, like the Clover Bar plant, is fired by natural gas which is the cleanest of any conventional fuel," he explains.

However, the plant does produce one major pollutant, nitrogen oxide, and this emission causes concern for Alberta Environment officials. Consequently, they had been talking with Edmonton Power over the last few years about improving emission controls at the elderly plant, built in the 1930s.

The result, says George Knowles, research planning director for Edmonton Power, is a system of flue gas re-circulation which has halved the plant's output of NO_X from 150 to 75 parts per million.

It has also resulted in the company setting up its own computerized air monitoring system. The results from the system are sent to Alberta Environment monthly and also form the heart of Edmonton Power's annual report to the province.

Just as the Rossdale plant is one of the most visible pollution sources in Edmonton the Western Co-op Fertilizer plant is one of the most obvious sources of air pollution in Calgary.

The plant, situated on the city's far southeastern limits, has until recently been well away from residential areas so that its emissions of ammonia, nitrogen oxide, sulphur oxides, sulphuric acid and fluorides have been visible but not a particular nuisance.

However, a recent decision by Calgary city council to allow developers to create housing developments in the area has thrust Co-op Fertilizer into the public spotlight.

The company's image has been hurt by the fact that it is the only fertilizer company in Alberta unable to meet Alberta Environment's suggested guidelines for emissions.

However, Witthoeft points out that the guidelines are only suggestions, not legally enforceable rules like the standards listed on Western Co-op's licence.

"As far as their licence is concerned, they are in compliance except for the particulate emission," explains Witthoeft.

The environment minister, pursuing the government's policy of negotiation, has given Western Co-op until 1984 to bring some of its six separate plants at the Barlow Trail site into compliance with the guidelines.

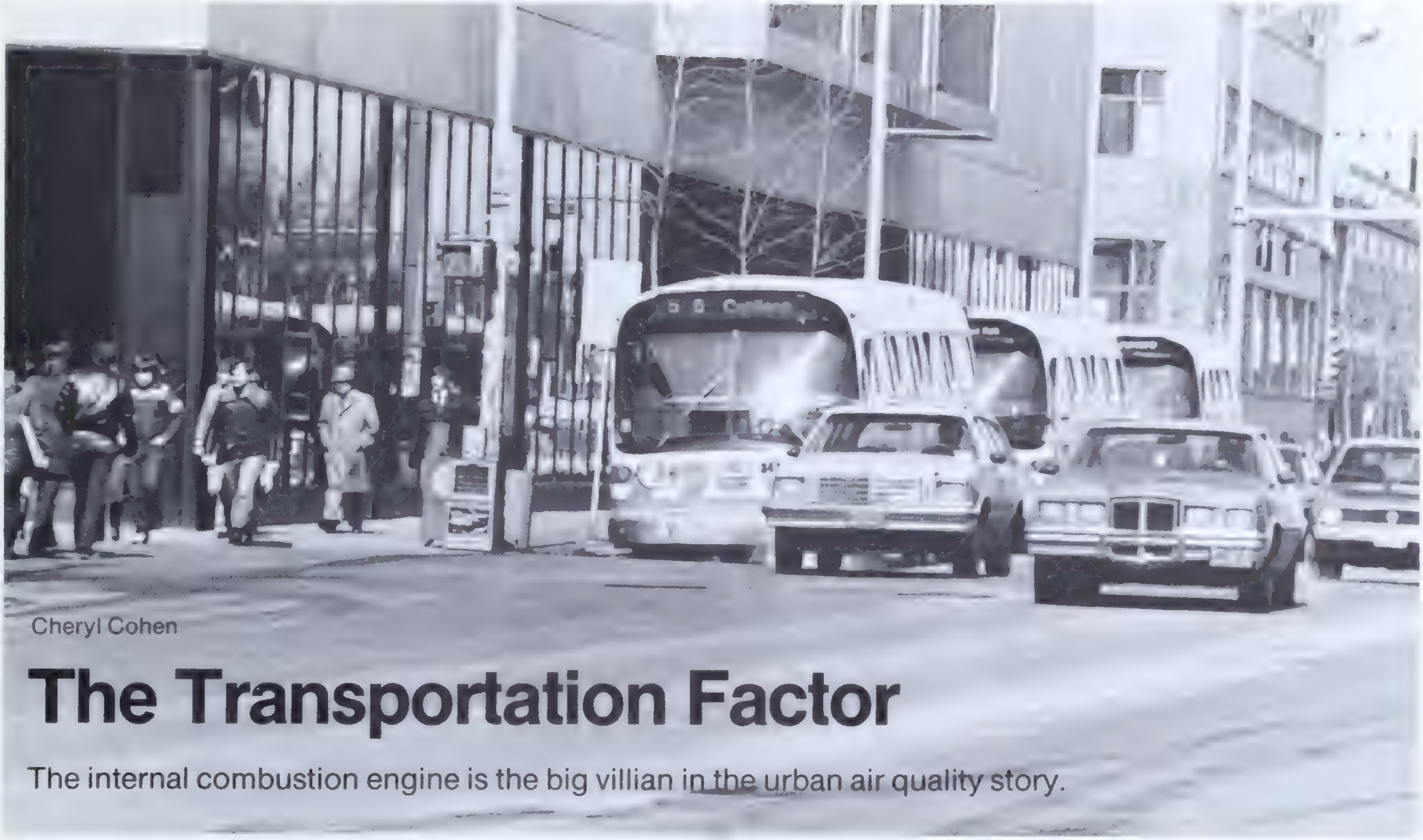
David Wood, the company's vice-president for public affairs, says his company will meet the extended deadline but says that they badly needed the extra time.

The reason, he says, is that Co-op had to bring not one, but two plants under the guidelines. The company's plant in Medicine Hat, built in 1956, needed extensive work to achieve today's more stringent emission standards.

In Medicine Hat the expense of building a new sulphuric acid plant, only one of many changes necessary to meet the standards, was $22 million.

"We don't have limitless funds, and all we can do is the best we can as fast as we can, with what we have."

Norma Ramage is a Calgary freelance writer



Cheryl Cohen

The Transportation Factor

The internal combustion engine is the big villian in the urban air quality story.

In the human body, blood is sent to specific organs for cleansing.

Unfortunately for city-dwellers, the arteries through which motor vehicles travel have no such magic treatment centres at their disposal.

Motor vehicles — the lifeblood of North America — course through our highways, leaving in their wake tonnes of potentially hazardous substances.

Transportation is easily recognizable as a major source of air pollution in this province. An inventory of emissions in Alberta's biggest cities shows motor vehicles are responsible for about 40 per cent of total emissions in Edmonton and 80 per cent in Calgary.

The motor vehicle emits carbon monoxide (CO), a colorless, odorless, tasteless gas produced by the incomplete combustion of fuel; oxides of nitrogen (NO_x), formed by the combining of oxygen and nitrogen in high-temperature combustion; and hydrocarbons (HC), traces of unburned fuels.

An Alberta Environment-Alberta Motor Association-Environment Canada report on 1978 test automobile idle exhaust emissions concluded there was a potential for reducing motor vehicle-caused CO and HC emissions by 50 per cent and 20 per cent respectively, with proper maintenance.

In the 1,000-vehicle test, with the average vehicle travelling 18,680 km/year, the emission reduction for that number of cars in one year would be 233,500 kg of CO and 11,395 kg of HC with proper tune-ups.

Applying those figures to Alberta's total vehicle fleet of 900,000 cars would mean *reductions* in one year of 210,150 tonnes of CO and 10,255 tonnes of HC!

Alberta Environment collaborated with Alberta Energy and Natural Resources last year to do another round of emissions tests and a report is to be published this spring.

John Torneby

This time 3,009 vehicles were tested (the public is encouraged to bring cars in for free examination) and, says John Torneby, technical support section head in Environment's air-quality control branch, results showed some improvement in emissions.

"We're seeing a higher percentage of newer cars." Torneby notes that newer cars have better pollution control systems in place. Since 1971, manufacturers have had to conform to federal government guidelines aimed at combatting air pollution from new vehicles.

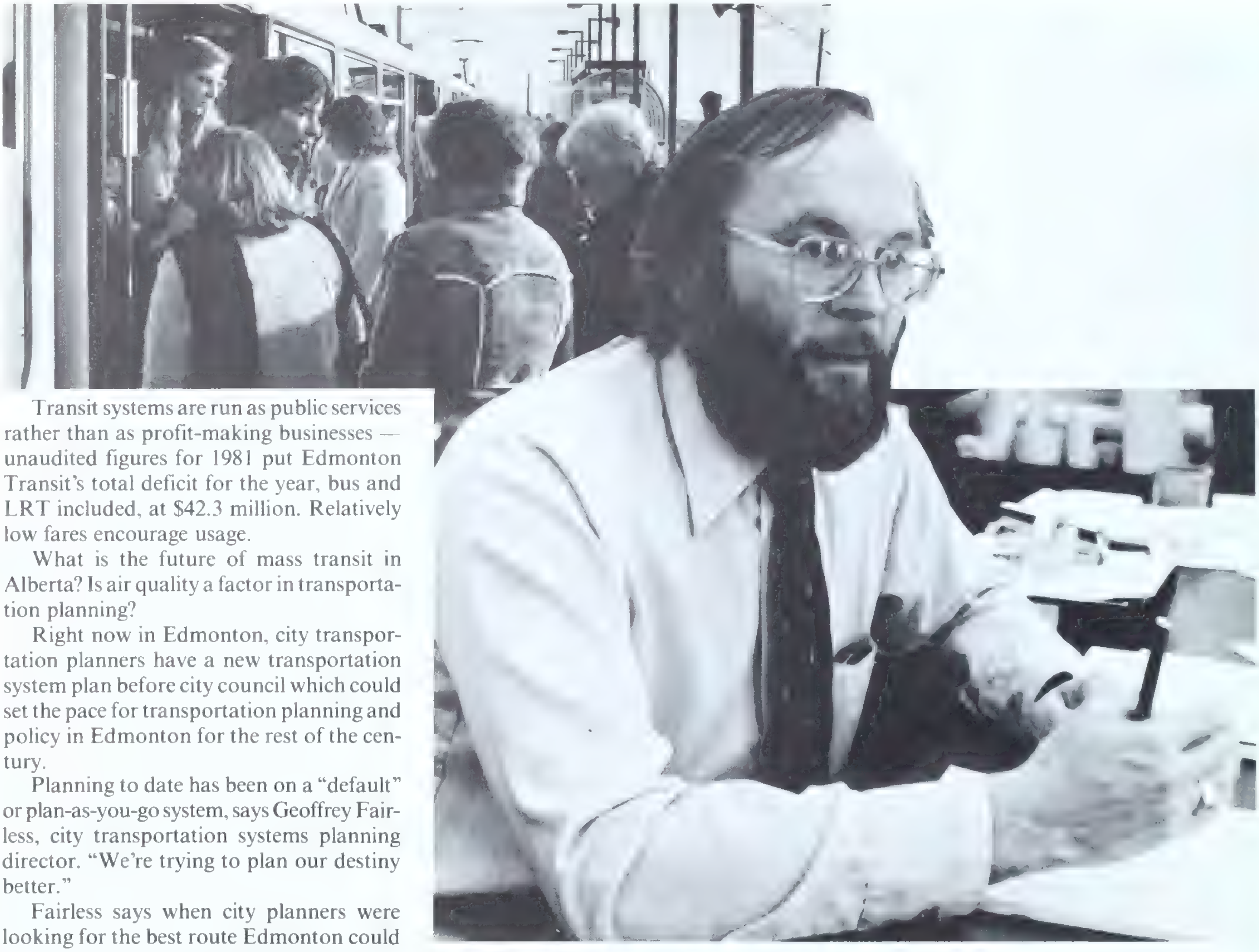
Engines have been redesigned, and now it's common for a car to have such emission-control devices as thermostatic air cleaners, positive crankcase ventilation, air pumps and catalytic converters.

Once a car is in the hands of an individual owner, however, there is no legislation in Alberta controlling the vehicle's emissions. The only incentive car owners have to keep their emission-control devices in place and operating properly is the better fuel economy that comes with good maintenance.

But the car is not alone on the roads of Alberta's cities — there is also mass public transportation in the form of buses and, in Calgary and Edmonton, light rail transit (LRT).

That buses and LRT systems help reduce traffic congestion (and therefore air pollution) was brought home to many Edmontonians during this spring's bus strike. Increased car pooling failed to prevent major traffic jams in peak hours.

When the buses are running, ridership is high — 130-135 rides per capita per year in Edmonton, 95-100 in Calgary. This compares to rides per capita per year in Houston of 17.3; in Seattle of 53 and in San Diego of 19.2.



Geoffrey Fairless

Transit systems are run as public services rather than as profit-making businesses — unaudited figures for 1981 put Edmonton Transit's total deficit for the year, bus and LRT included, at $42.3 million. Relatively low fares encourage usage.

What is the future of mass transit in Alberta? Is air quality a factor in transportation planning?

Right now in Edmonton, city transportation planners have a new transportation system plan before city council which could set the pace for transportation planning and policy in Edmonton for the rest of the century.

Planning to date has been on a "default" or plan-as-you-go system, says Geoffrey Fairless, city transportation systems planning director. "We're trying to plan our destiny better."

Fairless says when city planners were looking for the best route Edmonton could follow in future transportation planning, four alternatives were considered: default, auto-oriented, transit-oriented and "balanced" strategies.

The latter was chosen, "to give each mode of transportation recognition." An emphasis on transit trips in the downtown and university areas at peak periods, on the car for local trips e.g. to suburban supermarkets, and on an arterial system for "offbeat" travel are features.

In comparing the alternative strategies, Fairless says, planners did look at "nitrogen oxides, carbon monoxide emissions, etc., and forecast how many tonnes would be put into the air."

"We didn't say which is the worst thing that pollutes the atmosphere. We just said, globally, this alternative looks best."

The public, he adds, doesn't seem to place much importance on air quality in discussions about transportation systems.

Alberta Transportation's Bill Lambert, senior transportation officer with the urban transportation section, says, "Air quality is a general objective in planning, but something like transportation noise you can take into account more easily than air pollution."

The province participates in transportation planning when major roadways are involved, Lambert says. In 1981, the province budgeted more than $180 million for urban transportation grants to the cities for public transit and roadway capital and operational funding (i.e. for purchasing or construction as well as for maintenance).

One official, who wished to remain anonymous, said people aren't ready for a drastic transportation change that would mean an overnight demand to make less use of the automobile. Planners have to tread carefully or any move toward increased use of mass transit could meet with great resistance.

Assuming Edmonton grows according to estimates — to 1.5 million by 2021 — public transit is the only way to go, concedes Fairless.

But public transit "has a role that is clearly defined," he stresses, and "we have to go through a balanced strategy first."

Alberta's big-city planners know that, to ensure manageability of the increased traffic flow that will accompany an increasing population, alternatives to inefficient one-to-a-car travel must be made more attractive in heavy-traffic areas.

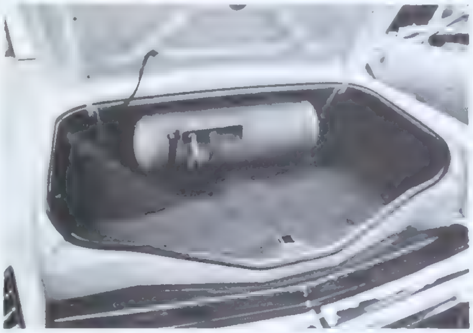
On the cards are increased privileges for buses and, perhaps, car pools — i.e. more specially designated lanes that allow certain vehicles to avoid normal traffic tieups — as well as more controlled parking policies, encouraging 'park-and-ride' into problem traffic areas.

While Albertans might find much less emphasis being placed on cars for transportation 15 to 20 years down the road, the increasing cost of gasoline and a minority concern for air quality have already made some drivers take a second look at their own automobiles' fuel consumption, perhaps causing them to drive less or consider conversion to cheaper fuels.

There has been some push from government toward finding alternatives to gas for reasons such as energy security, notes Steve Tyler, manager of policy analysis and liaison at the energy conservation branch of Alberta Energy and Natural Resources.

"But the push comes mainly from the federal government and Ontario. We're

Propane as an automobile fuel is clean-burning and less costly



Dennis Stahl

(Alberta) not too concerned, partly because we're expecting to have considerable oil available from the oil sands."

Nevertheless, some Albertans are turning their backs on the gas pumps and 34-cent-a-litre fuel, opting instead for cleaner-burning, less costly alternative fuels, such as propane and natural gas.

Propane as a vehicle fuel is becoming very popular now, says Tyler, who watches with interest as "We do propane conversions" ads increase in number in the Yellow Pages.

Ottawa offers a $400 rebate for any commercial vehicle converted to propane; $600 is available to anyone who converts to natural gas, but mileage records must then be kept.

Tyler says converting a vehicle to propane costs between $1,200 and $1,500. A compressed natural gas conversion is about $2,300.

Propane promoter Dennis Stahl, Prairie regional director for Minit-Tune Alberta Corp., which converts vehicles to propane, uses propane in his own car.

He says that, at a cost of about 15 cents a litre, a "comparatively nil" output of hydrocarbons, half the number of oil changes, much longer motor life because of clean-burning qualities and three times the spark-plug life, propane is definitely a viable alternative to gasoline.

Filling up is not a problem either, he says. "I travel between here (Edmonton), Saskatchewan and Manitoba, and I haven't had any trouble getting propane at all."

Propane is a byproduct of natural gas separation. In a converted vehicle it travels from the tank under pressure into the carburetor, moving from liquid to vapor through a vapor converter to the engine.

"With propane there really literally is no pollution," Stahl says. "I think the government should push it more." Ontario, he notes, offers conversion tax incentives. "Alberta has done nothing."

CNG Fuel Systems Ltd. has the headquarters of its expanding venture into the compressed natural gas market in Calgary. The company has conversion centres in Calgary and Vancouver and has just opened a compressor plant in Brampton, Ont.

Janet Devine, CNG assistant communication manager, knows of only one other Canadian firm doing natural gas conversions.

CNG can compete with other fuels, Devine says, but refuelling is a problem. However she says CNG will be available from existing petrol stations shortly.

CNG costs about 19 cents a litre. It's very clean-burning and has an octane rating of 135, compared to 100 for propane and 85 to 95 for gasoline. Basically methane, and therefore already a gas, it doesn't require oxidization and so cold-weather starts are quicker.

According to CNG Fuel Systems research, emissions at grams per mile in a vehicle that emits 0.68 g/mi of HC, 3.63 of CO and 1.37 of NO_x, with gasoline are: 0.4 (HC), 1.75 (CO) and 1.06 (NO_x for propane and 0.25 (HC), 0.1 (CO) and 0.5 (NO_x) for CNG.

CNG or propane fuel conversions are done on a dual-fuel (gasoline and natural gas or gasoline and propane) basis.

Stahl sees natural gas as a popular alternative to gasoline in the future.

"In talking with people, they feel in a few years down the road natural gas will be the thing. You'd pull a hose out of the corner of your house and refill your tank with natural gas."

His firm, he says, could easily change over to natural gas conversions.

Other alternative fuels being tested in Canada and the US include alcohols, hydrogen and electricity. All have interesting possibilities, but Alberta authorities don't expect any to be in widespread use here in the foreseeable future.

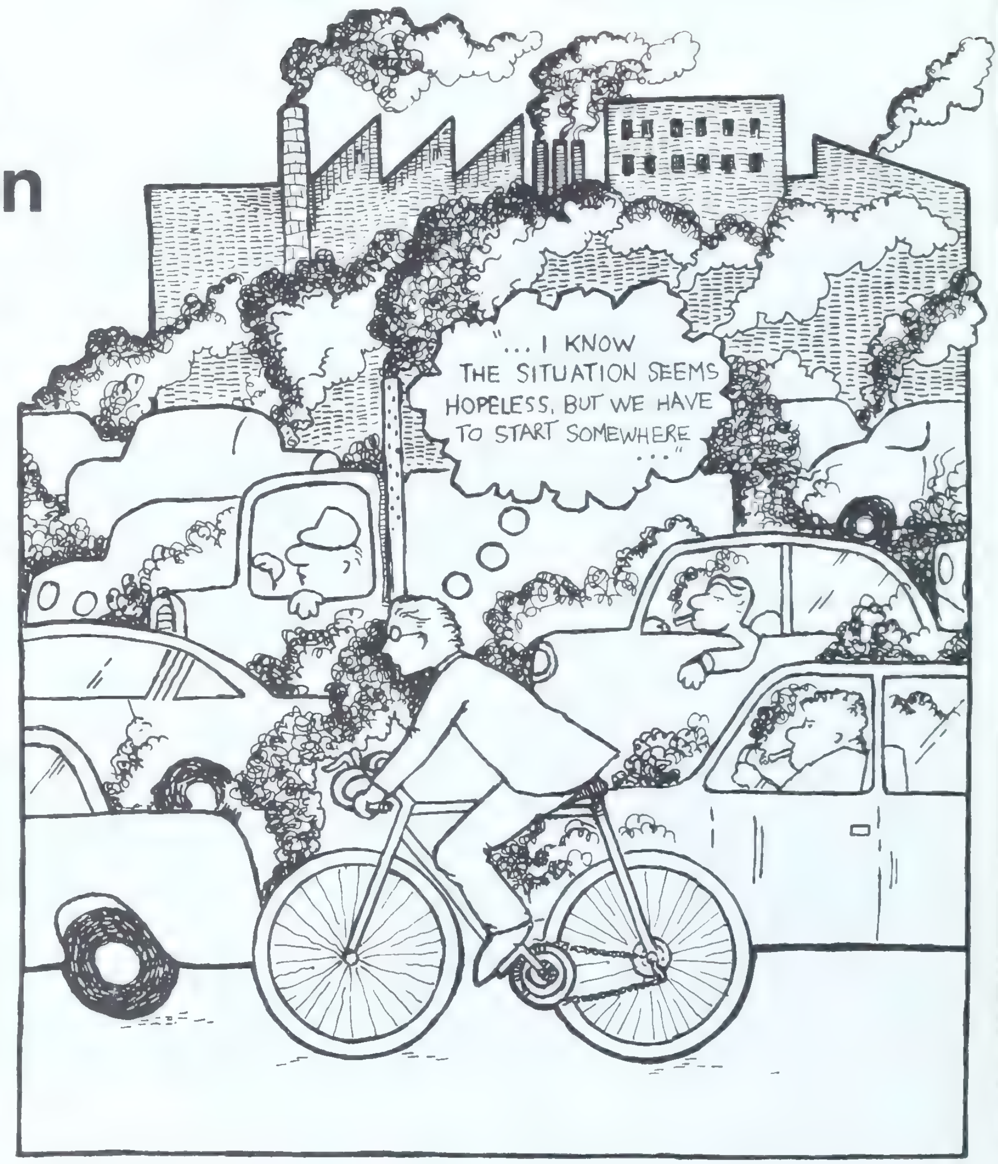
Some of the alcohols are on the market elsewhere in Canada. "But they are not nearly as clean-burning and not nearly as efficient," Tyler says. The advantage is that they are a renewable source of energy, but alcohol is not yet a competitive fuel anywhere in Canada.

Cheryl Cohen is an Edmonton journalist

Helen Corbett

Taking Action on Air Pollution

Individuals have a role to play in the fight against air pollution.


"... I KNOW THE SITUATION SEEMS HOPELESS, BUT WE HAVE TO START SOMEWHERE ..."

One of the most precious resources we have left today is right under your nose.

You. Your ideas. Your choices. Your actions.

As an individual, you will make all the difference in the on-going struggle to clean up the pall of pollution hanging over our cities.

Consider one man's solution for a better, less polluted world that recently appeared in a Canadian health magazine.

"I know the situation seems hopeless, but we have to start somewhere. It's so important that some of us do something, even if it's only to start with," he writes in a letter.

"I have stopped driving a car. (When it broke down, I decided not to get it fixed.) I bicycle everywhere instead. I recycle everything — glass, tins, newspapers and I buy nothing new — second-hand clothes, etc."

Now these measures may sound pretty insignificant against the litany of air pollutants emitted by gas plants, cars, aircraft, incinerators, pesticides and so on. But as any reader of history knows, real change starts with the individual, snowballs into a grass-roots movement and eventually alters our social, economic and political fabric.

"People have no idea how *much* impact they can make on the urban air pollution problem," observes Joan Wilson of the Clean Calgary Committee. "They can make an effort to reduce their own pollution, or they can act on a wider scale, pressuring the government for anti-pollution legislation."

Unfortunately, she adds, people are too apathetic about the effect of their own measures.

"They'll see a large yellow cloud of pollution hanging over Calgary, yet they won't say to their neighbor, 'Let's double up in a car pool.' "

Your own personal pollution control can easily start with your own vehicle, since exhaust emissions are a major factor in Alberta's air pollution. The internal combustion engine, unable to burn fuel completely, spews out a harmful combination of nitrous oxide, carbon monoxide, and hydrocarbons.

Get into the habit of asking yourself, "Do I need to drive?" before hopping into your car. Can the bus or light rail transport take you to your destination? Public transit can carry 50 times as many people as the single-passenger car, at a fraction of the pollution cost. It also eliminates parking costs, while enabling the rider to work, read or just people-watch on the way to work.

Try travelling in car pools. Ask a neighbor, start a telephone network, advertise in your local paper, organize your office floor. The car pool saves your gas bill, parking, car maintenance and also saves our air quality.

Use your legs as much as possible. Sling a pack on your back and ride a bike or walk to your destination. You save money and energy, as well as keeping in shape.

If you must use a vehicle, the best way to reduce its emissions is to keep it well-maintained. In fact, a properly-tuned car will increase your fuel economy from 10 to 15 per cent, says Steve Tyler of Alberta Energy and Natural Resources.

There are several maintenance checks you can make yourself. Ensure that your car tires are inflated to the proper pressure to prevent extra tire friction. Its wheels are aligned to prevent tire drag and engine parts well lubricated for smooth running.

Check your spark plugs every three months. Even with unleaded fuel, your car emissions increase if even one spark plus is misfiring or not firing at all. Beware of breaks in your exhaust line, which may or may not include lost mufflers.

Make sure your anti-pollution devices are in place and working properly. In newer cars, manufacturers claim a small gain in fuel mileage if the devices are working properly.

Watch for other areas that can result in increased emission: batteries, air filters, belts and radiator hoses.

You can drive in energy conserving ways, too. Slow down on the highway; tests have shown cars use 20 per cent less fuel when driven at 90 kph instead of 110 kph. Avoid sudden stops and starts — they use more

Joan Wilson

fuel and wear out tires. Don't idle your car excessively; turn the car off if you're waiting for someone or caught in a traffic jam. When starting, the car requires only half a minute to lubricate the engine, but drive slowly if the weather is cold.

Personal pollution control carries into the home too. You can cut your energy consumption if your furnace is tuned, your house insulated, windows and doors sealed from drafts, and your thermostat lowered.

To maintain your furnace at peak efficiency, clean the air filters with a vacuum every few weeks. Make sure the burners are clean, and vacuum around the burner compartment to clear the area of dust.

Once a year, the furnace blower motor should be inspected to ensure the blades aren't constricted.

"You don't have to be an electrician to check the blower motor," says Charlie Moore of Northwestern Utilities Ltd. "Many people remove the blower themselves and take the garden hose to it."

Your hot water heater burns gas as well. The sediment should be drained from it twice a year, the thermostat set between 50-60 degrees Celcius. Older water heaters can be wrapped in insulation (don't cover the controls or air intake for burners.)

Fireplaces, trash burners and incinerators contribute their share of pollutants, including soot, unburned hydrocarbons, carbon monoxide and carbon dioxide. In Alberta, where fireplaces are used largely for recreational purposes, we haven't had to deal with the serious pollution problems which have caused some American cities to ration fires. Trash and incinerator burning, however, is rigorously monitored in the province, and is either prohibited or requires a permit within most Alberta cities.

Even the garden doesn't escape man's chemicals, usually in the form of herbicides or pesticides. These should be avoided at all costs, but if you must spray, make sure there is little or no wind. A dried form of herbicide is preferable to a spray, so that it can be applied directly to the plants and not released into the atmosphere.

Aerosol sprays should also be avoided. It's now possible to buy most of the same products in contaners operated by air pumps. Aerosol cans release fluorocarbons which react with the ozone layer in the atmosphere, thereby exposing the earth to increased amounts of harmful ultra-violet rays.

Individual action need not be limited to your own pollution controls. You can support one of the many groups in the province engaged in political and public awareness about our urban air quality.

"Concern usually starts with a local project," says Martha Kostuch, a Rocky Mountain House veterinarian and environmentalist. "Talk to a local politician. Brief your friends on the problem. Contact the media: letters to the editor are very important. Talk in schools. You don't have to be an expert; just informed."

These tactics provide the foundation for many of the public activist groups in Alberta. The Alberta Wilderness Association, a 12-year-old, 1600-member group, devotes itself to the preservation and protection of wilderness and wild lands.

Air pollution issues occasionally crop up, says AWA's Brian Staszenski, when industry uses wilderness areas as chemical dumping grounds.

"We actively monitor the government and industry," he says. "We demand information from the government, keep our eyes on companies polluting the environment, and write lots of letters."

This kind of political activism is "hard and tiresome," says Staszenski, but in the long run "it does pay off."

Other groups, like the Alberta Lung Association, focus on public awareness rather than political pressure. First formed in 1939 to combat tuberculosis, this group has evolved into a powerful educator in the field of lung health. Last year, it reached 23,000 Albertans through school presentations, 'stop smoking' clinics, and lung disease pro-

Electric powered light rail transit (LRT) does not contribute to urban smog (right)

Keeping your vehicle well tuned will make it more efficient (centre)

grams at job sites, senior citizen homes and so on.

"We've always had air pollution," says Jahala Currie, a registered nurse with a 25-year association with the group. "Today our philosophy is to promote preventive health, which often means the ways you can protect your lungs from air pollution."

She reaches school children all over southern Alberta, warning them to protect their lungs from dust, dirt, germs, car exhaust, and fumes from glue and smoking.

It is through the widespread educational efforts of groups like the Alberta Lung Association that we begin to make positive changes for our environment and the future of the human race. These groups all depend on the individual working towards a massive shift of social priorities to check pollution.

"We've done a lot," reflects Kostuch. "I've seen things happen. And the change starts to happen when people start getting concerned."

Controlling air pollution is now a *necessary* task for each of us as individuals. We can no longer passively assume "they" – government, industry, or the next-door neighbor — will look after things if pollution is so bad. "They" are moved by people; the more of them, the better.

One further bit of advice from our friend who is working toward a better, less polluted world: "Last, but not least," he writes, "I do a lot of praying. Maybe that's the best way of all to make this a better world."

Helen Corbett is a freelance writer who lives in Canmore

Letters

Editor's note: Environment Views *is co-ordinated by an independent editorial board with representatives from government, industry and the public. The views expressed are not necessarily those of Alberta Environment, and the editor and writers are contracted on a freelance basis.*

Keep Fighting

Please remove our names from the mailing list of *Environment Views*. Although the articles are timely and well written, we find it increasingly difficult, considering our political leanings, to accept Progressive Conservative literature into our home.

The Lougheed government's callous and irresponsible attitudes and actions toward the environment are reflected in several of the following scenarios over the past decade:

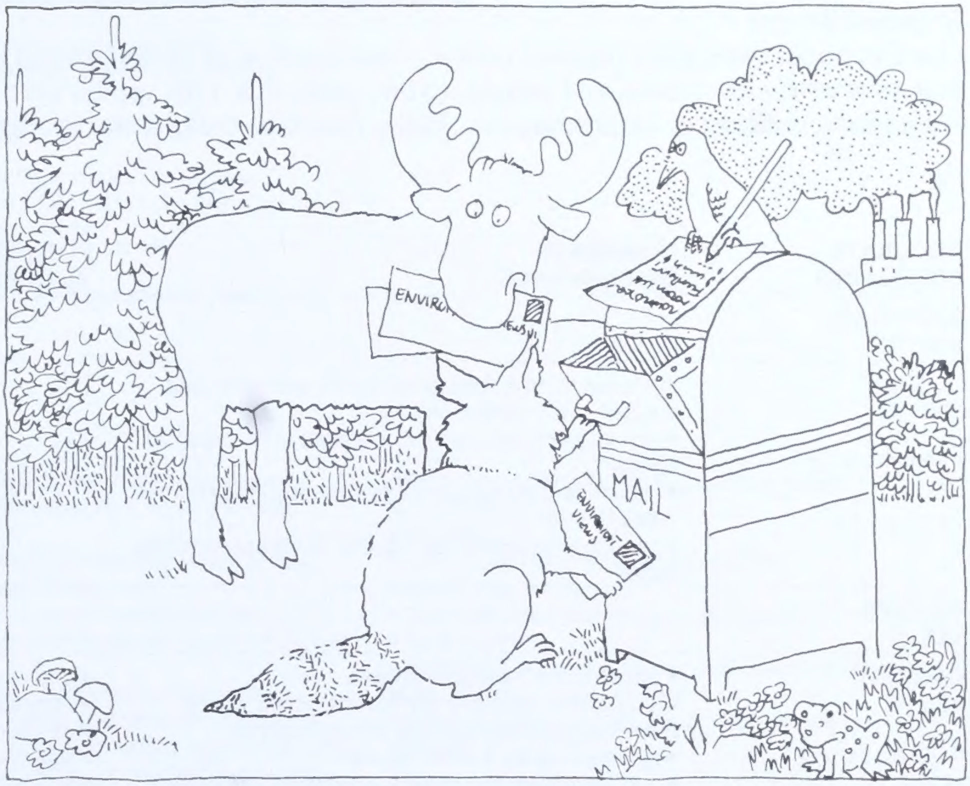
- the Kananaskis road issue;
- the dismantling of the ECA;
- the Odyssey proposal, with no public participation;
- non-action on the Pincher Creek sour gas plants;
- oil exploration in the Manning region; and Suncor's abuse of the environment.

We would prefer to direct our energies toward our political party and their pro-environment stance.

Thank you and keep fighting,
Dean and Patti Roberts
Calgary

Student of western issues

Your journal provides me with a western Canadian viewpoint on environmental issues. Ontario-based publications do not adequately represent Alberta's concerns on environment/energy issues. For example, your article "Getting Ready" (5(1): 17-20), was an interesting account of Alberta's problems coping with energy/economic/social development. Such articles are rarely evident, even in "national" magazines (generally based in Ontario).



I would appreciate very much if you could send me a copy of each issue of the first four volumes as I am eager to read what I have missed. This interests me greatly as I am a fourth year undergraduate at the University of Toronto majoring in Environmental Studies.

Sincerely,
Glenn Coady
Toronto, Ontario

Cold Lake protected

I would like to draw your attention to an error in the October-November-December 1981 issue of Environment Views. On page 37, in Susan Mayse's article on "The North," the statement is made that Esso "declined" to use North Saskatchewan River water for its proposed Cold Lake heavy oil project . . . "because the water was not of good enough quality for the steam process . . ."

This statement is not correct. Esso's prefered water source for the Cold Lake project would be Cold Lake, however, local intervenors were successful in persuading the Alberta Energy Resources Conservation Board in 1979 to direct Esso to use the North Saskatchewan River as its fresh water source. Although water from this source is not as high quality as that from Cold Lake, it can be adequately treated and used in the proposed commercial-scale heavy oil project. As a result of the ERCB's directive, Esso's plans call for a 100 km pipeline and additional treating facilities to handle the river water at an additional cost to the project in excess of $100 million.

Sincerely
H. Glenn Rainbird
Manager, Public Affairs Division
Esso Resources Canada Ltd.

Pump in field, Calmar-Leduc area

Regional Review

Our December issue was a regional review — an overview of environmental issues throughout the province. In that issue we enclosed cards and asked for your comments. Fifty replies were received, most with interesting suggestions, criticism or commendation. This is how they broke down by region:

ACCURATE COVERAGE?	COMMENTS ON COVERAGE	FUTURE TOPICS SUGGESTED
SOUTHEAST YES - 1		
OLDMAN YES - 2 PARTIALLY - 2 NO - 1	• needed more emphasis on growth problems, and problems with dryland salinity • anti-irrigation bias, too much weight to unsupported opinion • re ranching: no mention of overgrazing in east slopes areas of south • need to emphasize that irrigation is not economically viable.	
PALLISER YES - 1		
CALGARY YES - 5 PARTIALLY — 2 NO - 2 NO COMMENT - 1	• article lacked overall emphasis • journalistic treatment, giving "interesting" items, presented simplistically and without analysis • ignored Calgary's urban sprawl • concerned that the Alberta government is not doing enough about water problems: eroded watersheds, damaged reservoirs and transmission systems • I don't think article indicates how serious the problem really is • should remove vehicles from the city core • greatly understressed the appalling atmospheric pollution caused by automobile traffic; the photo of Calgary is atypical — the smog pall is more often there than not	• conservation as a way of life • inner city environment • city transportation • economic environment of the city • ecological reserves • soil conservation • timber harvesting • H_2S and NO_x emission control
EASTERN SLOPES YES - 4 NO - 2	• "problems of the East Slopes are not "people" but the planning by government . . . for development . . . • ignored lack of integrated planning in Canmore area • "article does not portray interagency disagreement in planning Kananskis Country . . ." • impact of industrial development understated • Re: the Eastern Slopes "non policy:" it appears what is good for general business is good for everybody."	• " . . . should present an article which details the instances when the elected government overruled or at least ignored the recommendations and findings of the professional segment of the Alberta civil service I'll bet it's shocking and disgusting . . ."
RED DEER YES - 5	• "good job, considerating space limitations" • need to emphasize the encroachment of city on agricultural land and desire of county to expand industrial uses on agricultural land	• no increase in SO_2 levels • zero discharge of pollutants and nutrients to waterways • energy conservation water treatment • pollution from feedlots • control of emissions from sour gas plants

Edmonton, from Capital City Park

BATTLE RIVER YES - 2 PARTIALLY - 1 NO - 2	• needed more mention of sour gas plants • missed threat of hazardous waste plant being located in area • "you are giving this region long overdue recognition and assessment . . ." • needed more input from naturalists' groups • public hearings are a farce when the government has already made up its mind . . .	
SOUTHEAST ALBERTA PARTIALLY - 1	• needed more balanced information on the Suffield range	
THE NORTH YES - 1 NO - 1		
EDMONTON YES - 8 NO - 1	• "an oversimplification of some of the problems confronting residents of the province — will look forward to more detail" • am not concerned with farming issues but rather noise levels near residential areas • "my compliments on a very concise and well-balanced reporting on all the current issues throughout the province" • excellent issue, covering a number of sensitive issues well — good editing and selection of pictures" • maybe needed to mention impact of Wabamun Lake plants on the lake and dumping of effluents into the North Sask. River.	• land use conflicts eg. coal generated power vs. agriculture • acid rain • pollution of North Saskatchewan River • land use planning • how uses are assigned for public lands • parks in cities • residential and industrial development in wilderness areas and on agricultural land • water diversion — the most ominous threat to Alberta's environment
PEACE RIVER YES - 1 PARTIALLY - 2 NO - 1	• "superficial, uninformed and biased . . . " • "it was an impossible task to incorporate such a diverse number of regions and topics"	• would like to se an article on weather patterns changing due to the Bennett Dam

General Comments

- a welcome publication — have gained valuable knowledge
- surprisingly for a government publication, most sides are presented
- "I enjoy your publication and read it cover to cover."
- "at times one is suspicious that this publication is a house organ."
- "Environment Views is a valuable, informative publication — keep up the good work!"
- "we enjoy your Environment News very much"
- "a very provocative publication that deals with current "man versus Environment issues."
- extremely pleased with format and quality of your publication, appreciate receiving student teacher guide
- ". . . articles continue to distort the real environmental issues and their resolution . . . they are a plea for more waste . . . "
- "An excellent publication, always welcome"
- "A useful summary of environmental developments in Alberta"

If undelivered, return to:

Environment Views
Alberta Environment
9820 - 106 Street
Edmonton, Alberta T5K 2J6

Environment Update

ECA Moves

The Environment Council of Alberta has moved from the College Plaza in Edmonton to new offices on the 8th floor of the Weber Centre, 555 Calgary Trial in Edmonton.

Agricultural Land Meetings

The Environment Council of Alberta has begun a series of meetings leading up to public hearings on maintaining and expanding the agricultural land base in Alberta.

For more details, for dates and places of these meetings and for background information on the hearings call the ECA toll-free at Zenith 06075; from Edmonton call 427-5792.

Aquatic Toxicity Workshop

A call for papers has been issued for the 9th annual Aquatic Toxicity Workshop, to be held Nov. 2-5, in Edmonton.

Suggested subjects for papers are hazard assessment, biomonitoring, impact assessment, aquatic toxicity research advances, toxicity of industrial effluent, and multi-disciplinary approaches to toxicology.

Further information on the submission of papers is available from Dr. W. Mackay, 5434 44 St. Vegreville, Alta T0B 4L0, 432-3308.

National Environment Week

National Environment Week is May 30-June 5. Sponsored by Environment Canada, Alberta Environment, industry and public interest groups, the week will offer activities in both Calgary and Edmonton, tentatively scheduled as follows:

The national focus is on Calgary this year, and the main event will be a symposium on water issues to be held June 3 and 4 at the Calgary Convention Centre, sponsored by the National Environment Week Committee.

A national meeting of ENGO, (Environmental Non-government Organizations) is to be held at the University of Calgary June 5 and 6.

A dinner to present the Heaslip awards for environmental stewardship, presented by the National Survival Institute, will be held June 4 at the Calgary Convention Centre.

In Edmonton, there will be a forum on pesticides and displays at the Southgate Mall. In Calgary, there will be displays at the Canada Service Bureau and a lunchtime environmental film festival at the National Film Board May 30, June 2 and June 3.

If you have a short news item of province-wide interest you'd like to contribute to Environment Update, please send it to the editor at the address on the Contents page. The editor reserves the right to select and edit the items.